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Geology of the Klob Lake Area

District of Thunder Bay

By

S.E. Amukun

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FOREWORD

KLOB LAKE AREA

Detailed geological mapping of the Klob Lake area was undertaken by the Ontario Geological Survey, Ontario Ministry of Natural Resources, on behalf of the Ontario Ministry of Northern Affairs. This mapping is part of a larger program of geoscience surveys designed to encourage exploration interest and to provide a mineral potential evaluation and planning base for the Geraldton-Beardmore region.

The Klob Lake area was selected for mapping on the basis of existing exploration activity, the potential for gold mineralization environments similar to those in the Beardmore area, and the absence of previous detailed geological mapping.

V.G. Milne
Director
Ontario Geological Survey

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GEOLOGICAL MAP

(back pocket)

Map 2469 (coloured)–Klob Lake Area, District of Thunder Bay.

Scale 1:31 680 (1 inch to ½ mile).

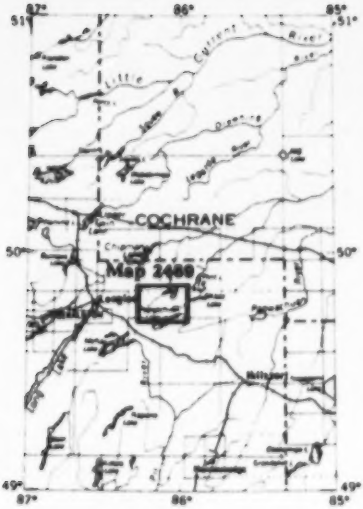

Figure 1–Key map showing location of the Klob Lake Area.
Scale 1:3 168 000 (1 inch to 50 miles).

ABSTRACT

The Klob Lake area covers parts of Pagwachuan, Klotz, Castlebar, and Proctor Lakes. The area is located some 30 km east of Longlac, or 320 km east of Thunder Bay and covers about 390 km^2.

Gold discoveries were made in the Longlac-Geraldton area west of the area in the early 1930s. This encouraged mineral exploration activity in the map area. Further encouragement was given by a number of gold prospects which were located within the map area.

All the consolidated rocks in the map area, except for Middle to Late Precambrian (Proterozoic) diabase dikes are of Early Precambrian (Archean) age. The Wabigoon and Quetico Subprovinces are prominent structural and petrological units in the map area, and form the easternmost extension of the Beardmore-Geraldton Metavolcanic-Metasedimentary Belt. The boundary between these belts, not previously defined on a formal basis appears to lie north of Pagwachuan Lake. The Quetico Subprovince to the south consists of a metamorphosed turbidite sequence with gneissic equivalents. These rocks are progressively metamorphosed southwards into metatexitic migmatite and into diatexitic stages that are developed outside the map area. The Wabigoon Subprovince to the north of the boundary is composed of metavolcanics into which are intruded three granite stocks. The metavolcanics are predominantly mafic to intermediate flows and flow breccias which exhibit a wide range of textures. Only minor amounts of felsic metavolcanics are present. There are 3 texturally and mineralogically distinct granitic stocks, informally named the Wee David Lake, O'Meara Lake, and Paglamin Lake Stocks.

The regional metamorphic rank attained by these rocks ranges from the chlorite and biotite zones of the greenschist facies in the metavolcanics to lower amphibolite facies rank in the metasediments. Diatexites are present in the migmatites outside the map area.

Faulting is the most prominent structural feature in the area. The Gravel River-Kamuck River Fault is interpreted to extend 180 km northeasterly into the map area. The supracrustal rocks in general face north and no major regional folds have been detected by the field party.

Quaternary deposits extensively overlie Precambrian bedrock in the area. Aeromagnetic maps have been used to extrapolate features observed in the surrounding exposed bedrock terrain to further the understanding of the bedrock in such areas.

Gold has been the primary mineral of economic interest in the map area since the early 1930s. No producing gold mines have operated in the map area. Theresa Gold Mine, located about 20 km west-southwest of the map area, operated between 1945 to 1955; 4800 ounces of gold and 202 ounces of silver were produced. Exploration surveys recently have been conducted in the area to search for massive sulphide deposits. Several conductor zones have been outlined, but those conductive areas tested to date have been reported to be due to graphitic zones containing disseminated to massive pyrite, pyrrhotite with or without minor magnetite, chalcopyrite, arsenopyrite, and sphalerite.

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CONVERSION FACTORS FOR MEASUREMENTS IN ONTARIO GEOLOGICAL SURVEY PUBLICATIONS

If the reader wishes to convert imperial units to SI (metric) units or SI units to imperial units the following multipliers should be used:

CONVERSION FROM SI TO IMPERIAL			CONVERSION FROM IMPERIAL TO SI		
SI Unit	*Multiplied by*	*Gives*	*Imperial Unit*	*Multiplied by*	*Gives*
			LENGTH		
1 mm	0.039 37	inches	1 inch	**25.4**	mm
1 cm	0.393 70	inches	1 inch	**2.54**	cm
1 m	3.280 84	feet	1 foot	**0.304 8**	m
1 m	0.049 709 7	chains	1 chain	20.116 8	m
1 km	0.621 371	miles (statute)	1 mile (statute)	**1.609 344**	km
			AREA		
1 cm^2	0.155 0	square inches	1 square inch	**6.451 6**	cm^2
1 m^2	10.763 9	square feet	1 square foot	**0.092 903 04**	m^2
1 km^2	0.386 10	square miles	1 square mile	2.589 988	km^2
1 ha	2.471 054	acres	1 acre	0.404 685 6	ha
			VOLUME		
1 cm^3	0.061 02	cubic inches	1 cubic inch	**16.387 064**	cm^3
1 m^3	35.314 7	cubic feet	1 cubic foot	0.028 316 85	m^3
1 m^3	1.308 0	cubic yards	1 cubic yard	0.764 555	m^3
			CAPACITY		
1 L	1.759 755	pints	1 pint	0.568 261	L
1 L	0.879 877	quarts	1 quart	1.136 522	L
1 L	0.219 969	gallons	1 gallon	**4.546 090**	L
			MASS		
1 g	0.035 273 96	ounces (avdp)	1 ounce (avdp)	28.349 523	g
1 g	0.032 150 75	ounces (troy)	1 ounce (troy)	**31.103 476 8**	g
1 kg	2.204 62	pounds (avdp)	1 pound (avdp)	**0.453 592 37**	kg
1 kg	0.001 102 3	tons (short)	1 ton (short)	**907.184 74**	kg
1 t	1.102 311	tons (short)	1 ton (short)	**0.907 184 74**	t
1 kg	0.000 984 21	tons (long)	1 ton (long)	**1016.046 908 8**	kg
1 t	0.984 206 5	tons (long)	1 ton (long)	**1.016 046 908 8**	t
			CONCENTRATION		
1 g/t	0.029 166 6	ounce (troy)/ ton (short)	1 ounce (troy)/ ton (short)	34.285 714 2	g/t
1 g/t	0.583 333 33	pennyweights/ ton (short)	1 pennyweight/ ton (short)	1.714 285 7	g/t

OTHER USEFUL CONVERSION FACTORS

1 ounce (troy)/ton (short)	20.0	pennyweights/ton (short)
1 pennyweight/ton (short)	0.05	ounce (troy)/ton (short)

NOTE–Conversion factors which are in bold type are exact. The conversion factors have been taken from or have been derived from factors given in the Metric Practice Guide for the Canadian Mining and Metallurgical Industries published by The Mining Association of Canada in co-operation with the Coal Association of Canada.

Geology

Of

Klob Lake Area

District of Thunder Bay

by

S.E. Amukun[1]

INTRODUCTION

Location and Access

The centre of the map area is located 30 km east of the town of Longlac and 320 km northeast of the city of Thunder Bay. The northern part of the Trans-Canada Highway, Highway 11, passes in an easterly direction through the middle of the map area. Klob Lake is a relatively small lake compared with the larger Pagwachuan, Klotz, Castlebar, and Proctor Lakes. The map area covers 390 km^2, and is bounded by Latitudes 49°43′ to 49°51′N and Longitude 85°55′ to 86°15′W (*see* Figure 1).

Access to points within the map area can be readily made because in addition to Highway 11, a system of gravel logging roads was established in the area during the logging operations of Kimberly Clark Limited. In addition, Highway 625 (to Caramat), and the Hornepayne line of the Canadian National Railways can be used for access to the southwestern part of the area. Except for the Fernow and Pagwachuan Rivers and the larger lakes, most of the lakes and rivers are not easily navigable because of rapids, waterfalls, and fallen logs or trees.

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[1]Formerly Geologist, Precambrian Geology Section, Ontario Geological Survey, Toronto. Presently Project Geologist, Urangesellschaft Canada Limited, Toronto [in 1983].

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Mining Exploration Activity

In the early 1930s, gold was discovered in the adjoining Longlac area to the west (Bruce 1935, 1936). In 1934 and 1936, a considerable amount of staking and development work was conducted east and west of Long Lake (Fairbairn 1938). Several gold prospects were located in the current map area during the 1930s, but none of these prospects became mines (MacDonald 1938; Evans 1945). These prospects included the property of Caramat Gold Mines Limited (presently owned by Milestone Exploration Limited (9)[1]), the Ward-Morrow Prospect, or the properties of Bellex Mines Limited [1970] (property owned by Bonnar H. Durst (5)), the Kenogamisis Gold Mines Limited (currrently owned by Shell Canada Resources Limited, (15)), and the Pagwachuan Lake Mining Syndicate Limited (currently covered by claims of L.J. and H.H. Otto (12)). Subsequent exploration work by the following companies, Caramat Gold Mines Limited in the 1960s, Bellex Mines Limited in 1970, Canadian Nickel Company Limited in 1971, Ranworth Exploration Limited in 1963, Can-Fer Mines Limited in 1958, H. Geno (1955), and C. Petit-A.W. Adam in 1963, concentrated on the areas occupied by some of the old prospects. These companies and prospectors also worked elsewhere in the map area in an effort to search for new prospects of gold, iron, or base metals (Assessment Files Research Office, Ontario Geological Survey, Toronto, and Regional Geologist's Files, Ontario Ministry of Natural Resources, Thunder Bay).

Several recent exploration programs have been conducted over isolated parts of the map area, and over some of the old gold prospects by the following: Hudson Bay Exploration and Development Company Limited in 1973 (airborne and ground geophysics - diamond drilling), L. Morrow in 1976 (diamond drilling), Pacific Cyprus Minerals Limited and/or Dora Explorations Limited in 1977 (airborne and ground geophysics), Mattagami Lake Mines Limited in 1977/78 (ground geophysics-geology/geochemistry - diamond drilling(?)), Placer Development in 1978/79 (ground geophysics - diamond drilling), Milestone Exploration Limited in the 1970s (mechanical work and diamond drilling), L.J. and H.H. Otto in 1971-1979 (mechanical work and diamond drilling), and Shell Canada Resources Limited in 1978/79 (airborne and ground geophysics). These programs investigated the old gold prospects, and were directed at conductive zones in search of base metals (Assessment Files Research Office, Ontario Geological Survey, Toronto, and the Regional Geologist's Files, Ontario Ministry of Natural Resources, Thunder Bay).

In 1979, during the current survey, Shell Canada Resources Limited conducted on their ground a systematic investigation within the map area and on the adjacent area. Most of this work involved geological and geophysical ground surveys as follow up to a previous airborne geophysical survey. New Jersey Zinc Exploration Company (Canada) Limited carried out a cursory examination of the entire map area, and Placer Development Limited anticipated undertaking a diamond-drill program on their Dora Exploration option.

[1]The number in parenthesis refers to the property list given on Map 2469, back pocket).

Previous Geological Studies

H.W. Fairbairn mapped the northern Long Lake area during the summer of 1936 (Fairbairn 1938) after several gold-bearing veins had been discovered east of Long Lake. R.D. MacDonald (1938, p.23) continued mapping eastward into the Pagwachuan Lake area, which includes most of the current map area. Both of these projects were undertaken by the then Ontario Department of Mines. Part of the area was also mapped by E.L. Evans in his 1941 study of the geology along Highway 11 (Evans 1945). The map area is included within the Caramat-Pagwa River Sheet, Geological Compilation Series, Map 2202 (Innes and Ayres 1971). Aeromagnetic maps are also available at a scale of 1:63 360 and 1:253 444 (Ontario Department of Mines-Geological Survey of Canada 1963a, 1963b, 1963c, and 1963d; 1965).

Several brief summaries of the geology of individual properties or a group of properties are given in geological and geophysical reports of various companies and individuals that have been filed for assessment credit (Assessment Files Research Office, Ontario Geological Survey, Toronto, and Resident Geologist's Files, Ontario Ministry of Natural Resources, Thunder Bay).

Present Geological Survey

Geological mapping was conducted by the author and his assistants between May 29 and August 25, 1979. Preliminary maps (P.2379 and P.2380) were published in 1980 (Amukun and Gillespie 1980a, 1980b) at a scale of 1:15 840.

The field maps were prepared at a scale of 1:15 840 on cronaflex base maps prepared by the Cartography Section, Surveys and Mapping Branch, Division of Lands, Ontario Ministry of Natural Resources, from maps of the Forestry Resources Inventory (FRI), Division of Forests, Ontario Ministry of Natural Resources. The geological field data was plotted in the field on acetate overlay sheets superimposed on aerial photographs having the same scale as the base maps. Minor topographic revisions were made on the base map during the survey.

Traverses were planned to cross the regional strike of the rocks at right angles and to examine all of the outcrops spotted on aerial photographs, or indicated on Map 466 of Fairbairn (1938) and MacDonald (1938).

In order to facilitate classification of granitic rocks in the field, all the granitic rocks collected were stained so that the potassic feldspar content could be determined. Selected specimens were submitted for chemical analyses and assay determinations; these were done by rapid methods at the Geoscience Laboratories, Ontario Geological Survey, Toronto. Selected rock samples were also examined in thin section.

Acknowledgments

Capable assistance was given by R.T. Gillespie who, as senior assistant, was responsible for the independent mapping of approximately half of the map area. Patricia Allen, L.K. Talvila, and S.R. Leppik served as junior assistants. Logistic aid was provided K.G. Fenwick in his capacity as Regional Geologist and by John Scott who took several of the photographs included in this report.

Informative discussions with Doris and Charles Andersen, Harold H. Otto, and Murdoch Mosher who were particularly helpful on the past exploration activity in the map area. The author and his assistants also extend special thanks to the Andersens for accommodation provided for them during the field season.

Topography and Drainage

The variation in relief within the map area is low; the maximum relief is less than 60 m. Some outcrops, however, form ridges as high as 60 m above relatively flat Pleistocene deposits north of the western end of Pagwachuan Lake. In addition, sinuous glacial ridges (eskers) west of Klotz Lake and around Wee David Lake attain heights of about 30.8 m. Glacial deposits by far exceed consolidated rock exposure because extensive flat sand plains cover many parts of the map area including Switzer Lake, southwest of Castlebar Lake, Hope-Faith-Charity Lakes, and west of Klotz Lake areas. The general topographic trend is approximately east-west, similar to the structural trend of the rocks.

The drainage of the area is controlled by the watershed separating the Great Lakes Drainage Basin and the Hudson Bay Drainage Basin. This height-of-land is located to the west of the map area, and runs northeasterly, north of Seagram Lake, between Hollow Rock and Rocky Shore Lakes, north of Sandlink Lakes, and then south towards Caramat Lake (MacDonald 1938, p.24). Because the map area lies near, but entirely north of the watershed, the streams draining it all flow in a northerly direction and are mostly small, and sluggish. Drainage channels are highly contorted such that most of them cannot be used as canoe routes. Hoiles Creek and its tributaries drain the central part of the map area and empty into Klotz Lake, which in turn drains through the Flint River to the Kenogami River, and eventually into Hudson Bay. The Pagwachuan River drains Pagwachuan Lake and flows northeastwards to the Kenogami River. Klob Creek drains northeasterly to Proctor Lake, which is, as well as Castlebar Lake, drained by Fernow Creek, which flows into Fernow Lake and eventually into Hudson Bay. In addition to the larger lakes such as Pagwachuan, Proctor, Castlebar, and Klotz Lakes, small and shallow lakes are numerous. Drainage between them is poor, and the shores are usually low, or open into swamps.

Eskers are prominent at the following locations:

1. west of Klotz Lake where they are utilized for sand and gravel for road construction
2. around Wee David Lake and the surrounding southern area where they have been partly used as natural sites along which logging roads are located

3. south of the west end of Adel Lake
4. northeast of the western end of Klob Lake
5. east and south of Toad Lake

GENERAL GEOLOGY

The Wabigoon and Quetico Subprovinces are dominant features in the map area. The map area comprises the easternmost extension of the east-trending Beadmore-Geraldton Metavolcanic-Metasedimentary Belt outlined by Pye *et al.* (1966). The boundary between the components of the belt have never been formally defined. Ayres (1969) has indicated that the boundary between them is stratigraphic and that there is no evidence for a major structural break. The interface between the Wabigoon and Quetico Subprovinces has also been implied to be a zone approximately 16 km wide by Mackasey *et al.* (1974). Where it has been formally defined, for example in the Mine Centre - Atikokan area (Wood 1976; Pirie 1978), the boundary between the 2 subprovinces is defined by the Quetico Fault which separates the rocks of the Quetico Subprovince predominantly metasediments to the south and the mixed metavolcanic-metasedimentary-granitic rocks of the Wabigoon Subprovince in the north. In the map area, no defined field marker horizon indicates the boundary; but an east-northeast trending zone is 1.5 km wide in the east and 3.2 km wide in the western part of the map area. This zone is located just north of Pagwachuan Lake, from south of Hoiles Lake to Decision Lake, and would separate the Quetico Subprovince to the south, and the Wabigoon Subprovince to the north. Outcrops mapped within the Quetico Subprovince consist of a metamorphosed turbidite sequence with zones of gneissic equivalents. These rocks become progressively metamorphosed to the south into diatexites, and are dominated by intrusion of pegmatitic material into the metasediments. Diatexites are well developed to the south just outside the map area. The Wabigoon Subprovince within the map area is composed of mafic to intermediate (approximately 95 percent) and minor (less than 5 percent) intermediate to felsic metavolcanics that are intruded by 3 granite rocks. The metavolcanics are predominantly composed of mafic to intermediate flows and flow breccias which exhibit a wide range of textures, but have a similar mineralogy. The bulk of the felsic metavolcanics occur as a subcircular mass of quartz-feldspar porphyry, herein interpreted by the author as a subvolcanic intrusive boss. The 3 granite stocks are texturally distinct. The Wee David Lake Stock is distinguished by having more mafic to intermediate phases than the other stocks.

Consolidated rocks in the map area are Early Precambrian (Archean) in age, except for the cross-cutting Middle to Late Precambrian (Proterozoic) diabase dikes. The distribution of outcrop in the map area is sparse. Outcrop accounts for only about 10 percent of the area. This limits the amount of geological interpretation that can be made.

The regional metamorphic rank to which the rocks have been subjected ranges from the chlorite zone of the greenschist facies (Turner 1968) in the metavolcanics to lower amphibolite facies conditions (Turner 1968) in the metasediments. Higher metamorphic facies than this are attained in the metasedi-

TABLE 1 | TABLE OF LITHOLOGIC UNITS FOR THE KLOB LAKE AREA.

PHANEROZOIC

CENOZOIC

QUATERNARY

RECENT

Organic swamp, and alluvial deposits.

PLEISTOCENE

Outwash deposits and moraine (sand and gravel, clay, silt, and till).

Unconformity

PRECAMBRIAN

MIDDLE TO LATE PRECAMBRIAN

MAFIC INTRUSIVE ROCKS

Diabase, porphyritic diabase.

Intrusive Contact

EARLY PRECAMBRIAN (ARCHEAN)

FELSIC INTRUSIVE ROCKS

O'MEARA AND PAGLAMIN LAKE STOCKS

Quartz porphyry, pegmatite, aplite, trondhjemite, granodiorite.

Intrusive or Gradational Contact

WEE DAVID LAKE STOCK

Diorite, syenodiorite, trondhjemite, granodiorite, agmatite, aplite.

Intrusive Contact

MIGMATITES

Paragneiss, metatexite with tonalite leucosome, quartz monzonite leucosome, pegmatite.

Intrusive Contact

INTERMEDIATE TO MAFIC INTRUSIVE ROCKS

Hornblende gabbro, gabbro, diorite, mafic dike.

Intrusive Contact

METAVOLCANICS AND METASEDIMENTS

METASEDIMENTS

Interbanded wacke and mudstone, coarse-grained (gritty) sandstone, conglomerate, gneissic metasediment, sheared and/or unclassified metasediment, banded metasediment or tuff.

Ironstone, chert, ferruginous chert, graphite schist.

METAVOLCANICS

FELSIC TO INTERMEDIATE METAVOLCANICS

Tuff, lapillistone, lapilli-tuff, quartz and/or feldspar porphyry, felsic dike, sericite schist.

INTERMEDIATE TO MAFIC METAVOLCANICS

Pillowed flows, pillow breccias, flow breccias, coarse-grained volcanic rocks, interflow banded tuffs.

ments just south of the map area, along the Caramat Road (Highway 625).

The metavolcanics and metasediments in general face north, but local south facings have been recorded on Map 2469, back pocket. Major regional folds have not been identified during the course of this survey. The prominent structural features are faults. The Gravel River-Kamuck River Fault (Carter 1975) is about 180 km long, and extends into the map area near the southern border of the map area and passes through the metasediments. The lineament outlined along Klob Lake and Hoiles Creek by Innes and Ayres (1971) is a fault and is located in the southern part of the northern metavolcanic unit. In almost every case, the country rocks adjacent to the fault have been sheared, silicified, and/or brecciated.

Aeromagnetic maps are useful to extrapolate geology from exposed areas to those covered by drift, because the ironstone units display a magnetic effect which can readily be traced in the map area. Two of the granitic stocks can also be outlined by a defined magnetic expression.

Early Precambrian (Archean)

METAVOLCANICS

The metavolcanics underlie about 30 percent of the map area and occur as 2 separate units. The northern metavolcanic unit, about 12 km wide, is predominantly a submarine flow unit with isolated zones of pillow and/or flow breccias. This unit is intruded by a small porphyritic felsic to intermediate subvolcanic body 2.0 km southwest of Klob Lake and is also intruded by 3 granitic stocks. Only 1 outcrop of the approximately 0.4 km wide southern mafic to intermediate metavolcanic unit occurs in the map area. Several outcrops were mapped on strike outside the map area by MacDonald (1938) and others. This unit may be traced westwards as far as and possibly across Lake Nipigon, which is located 160 km west of the map area (Pye *et al.* 1966, Mackasey *et al.* 1974). Gold prospects are indicated on this band in the Beardmore-Jellicoe area on the Tashota-Geraldton Sheet (*see* Pye *et al.* 1966).

Seventeen samples of metavolcanic rocks were thin sectioned and 12 were submitted for complete chemical analyses. All the mafic to intermediate metavolcanics chemically analyzed range from andesite to basalt in composition. One porphyritic sample of the subvolcanic boss returned analyses of calc-alkaline rhyolite composition (Figures 2 and 3). All the relatively unaltered mafic metavolcanic pillowed flows and interflow banded tuffs (samples 3, 4, 8, 9 and 10, *in* Figure 2) were determined to be magnesium- and iron-rich tholeiites. The plotted positions for amygdaloidal/vesicular and spherulitic flows (samples 1, and 2 *in* Figure 2) together with an aquagene tuff (sample 5, *in* Figure 2) and silicified/altered unsubdivided metavolcanic (sample 7, in Figure 2) indicate a calc-alkaline basalt affinity for these samples. The chemistry of a sample from an epidotized core of a single pillow from a flow unit is intriguing. Although the results indicate the influence of epidote, the otherwise mafic metavolcanic rock approaches the analysis of a felsic metavolcanic rock in terms of a silica (SiO_2),

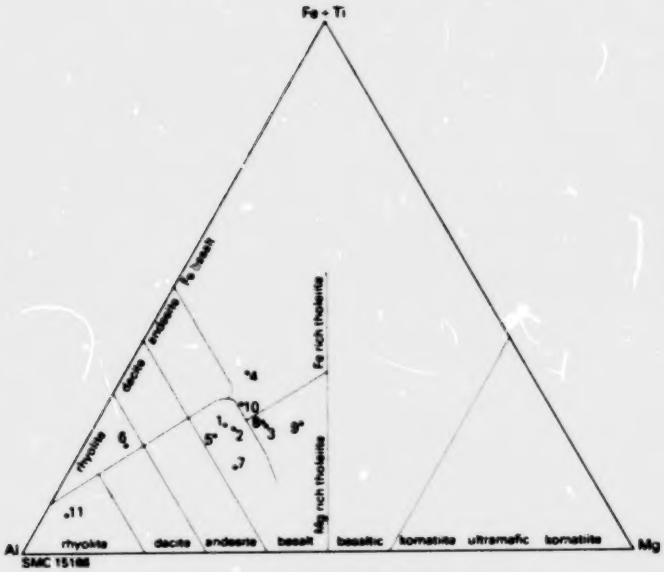


Figure 2–Jensen Cation Plot of Metavolcanics.

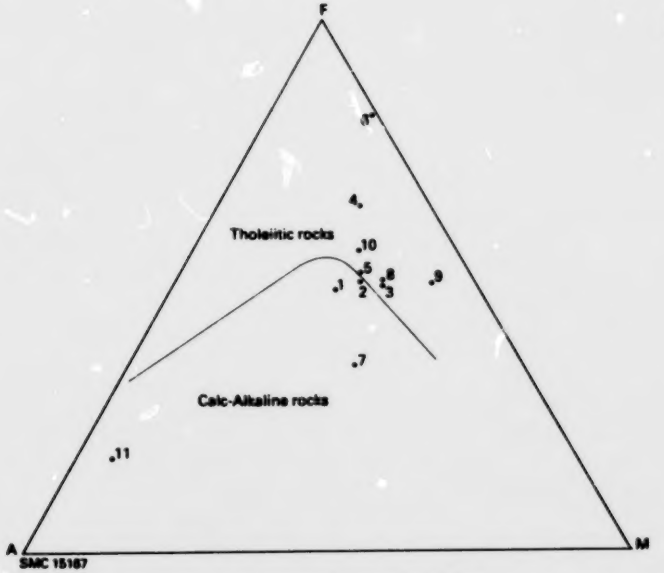


Figure 3–AFM Plot of Metavolcanics.

total iron, magnesium, and alumina (Figures 2 and 3).

MAFIC TO INTERMEDIATE METAVOLCANICS

Flows

PILLOWED FLOWS

The lavas exhibit a wide range of textures and structures. Most of the lavas are pillowed, and retain ellipsoidal pillow structures of variable size. In most of these pillow structures, deformation has obliterated the original size and shape, such that top determinations are generally unreliable to make. Some of the pillows display light grey-green cores which consist of visibly epidotized plagioclase, sericite, and chlorite.

Porphyritic flows are uncommon; where these rocks have been recorded, they are composed of anhedral to subhedral metacrysts of altered feldspar. In outcrops where diagnostic flow textures and structures are absent, it is difficult to distinguish the porphyritic flows from porphyritic intrusive feldspar (with or without quartz) porphyry dikes. The most reliable criteria may be intrusive features such as chilled margins, cross-cutting relationships, and uncommonly, the presence of xenoliths in the intrusive rock.

Recrystallized coarse-grained flows can be recognized only with difficulty without the presence of diagnostic flow features such as variolites, amydules, pillows, and epidotized cores. In the flows, as well as in mafic to intermediate tuffs and intrusive rocks, the increase in grain size is characterized by an increase in the amount of secondary hornblende or actinolite-tremolite. These minerals, in very coarse grained types, are the predominant ferromagnesium minerals and can constitute up to 80 percent of these rocks.

Amygdaloidal and/or vesicular phases of the flows are the most common. Quartz, calcite, and less commonly feldspar form the amygdules. Possibly, the presence of these minerals accounts for the calc-alkaline chemical composition of sample 1, Figures 2 and 3.

In outcrop, typical flows are fine to medium grained, grey-green, and dark green to shades of grey and black. These characteristics are independent of the mineralogy of the rocks. This is generally similar from rock to rock, and is dominantly chloritic, hornblendic, or feldspathic. Changes to the mineralogy have been induced by recrystallization (increase in grain size and amount of hornblende); shearing (increase in amount of chlorite, hornblende and/or quartz and decrease in grain size); metasomatism (addition of quartz, plagioclase and biotite), especially adjacent to granitic contacts where mixed, highly schistose and lighter, often banded or massive rocks are developed; and carbonatization.

Thin section study shows a typical less altered flow sample to consist predominantly of hornblende, plagioclase, chlorite, calcite, quartz, epidote, with lesser amounts of biotite, sericite, clinozoisite, almandine, and opaque miner-

TABLE 2 | CHEMICAL ANALYSES OF MAFIC TO INTERMEDIATE FLOWS, KLOB LAKE AREA.

No. on Figure*	Sample Number	SiO_2	Al_2O_3	Fe_2O_3	FeO	MgO	CaO	Na_2O	K_2O	H_2O^+	H_2O^-	CO_2	TiO_2	P_2O_5	S	MnO	Total	SG	Field Lithology
1.	9A-015	58.80	13.80	1.99	5.82	4.21	6.06	3.55	0.09	2.01	0.35	1.27	1.08	0.16	0.01	0.13	99.33	3.40	Amygdular Vesicular Pillow Flow
2.	9A-024	54.90	15.40	3.38	5.57	5.21	7.49	3.17	0.02	2.07	0.47	0.48	0.94	0.17	0.01	0.12	99.40	2.92	Spherulitic Flow Rocks
3.	9A-043	49.70	15.60	4.56	6.07	7.08	10.70	2.82	0.33	1.41	0.39	0.12	0.80	0.09	0.01	0.17	99.85	2.98	Pillow Flow
6.	9A-506	63.60	15.40	4.43	1.41	1.15	11.90	0.06	0.0	0.74	0.26	0.29	0.66	0.13	0.02	0.07	100.12	2.90	Epidotized Core, Pillowed Rocks
8.	9A-549	49.00	15.40	3.72	6.91	6.83	12.10	2.37	0.59	0.78	0.35	0.16	0.73	0.08	0.04	0.21	99.25	3.06	Pillow Flow
9.	9A-556	47.00	14.80	2.30	9.07	9.37	11.50	1.47	0.12	1.40	0.26	0.18	0.85	0.09	0.09	0.17	98.67	3.04	Recrystallized Flow

Notes:

CALCULATED ROCK NAMES (AFTER JENSEN 1976):

1. Calc-Alkaline Basalt.
2. Calc-Alkaline Basalt.
3. Tholeiitic Basalt.
6. Tholeiitic Rhyolite.
8. Tholeiitic Basalt.
9. Tholeiitic Basalt.

* See Figures 2 and 3
Sample 9 is not plotted on Map 2469, back pocket.

OGS 10 808

Photo 1–Pillow breccia outcrop with isolated epidotized fragments of pillow cores, from outcrops approximately 370 m due south of the middle of Klob Lake.

als. Chemical analyses of all the flows are presented in Table 2, and in the plots shown in Figures 2 and 3.

PILLOW BRECCIAS

A distinct unit of light grey to light green fine- to medium-grained rock, possibly a pillow breccia, is exposed south of Klob Lake. In these rocks, pillows are generally stretched into ellipsoidal to irregular shapes up to 2 m in their longer dimension. The breccia is composed of lightly weathered, randomly distributed fragments of isolated epidotized cores and/or pillows (Photo 1). A

OGS 10 609

Photo 2–Coarse-grained flow breccia outcrops with mafic, intermediate, and felsic fragments (light) set in a fine-grained chloritic groundmass (dark). Note that some fragments are porphyritic and/or spherulitic. The exposure is located 3.2 km southwest of the western end of Klob Lake.

spherulitic or variolitic texture composed of small radiating and concentrically arranged spheroidal aggregates (0.5 to 2 cm) of acicular crystals of tremolite-actinolite is also common in the pillow breccias. The breccias consist of epidotized fragments and spherulites. The epidotization may have changed the original bulk chemistry of the rocks from tholeiite to that of a rock having calc-alkaline affinity (sample 2, Figure 2). Even though the chemical analysis of sample 6, Figure 2, indicates the influence of epidotization, metasomatism has changed the composition of the otherwise mafic to intermediate rock into a more felsic composition by an increase in the amount of silica, total iron, magnesium, and alumina (Figures 2 and 3).

FLOW BRECCIAS

These rocks resemble fragmental pyroclastic rocks (Photo 2), and are distinguished from them by the presence of isolated angular pillow fragments retaining a fraction of a selvage along one edge, the presence of fragments of

aquagene tuff, and the abundance of amygdules, vesicles, and spherulites in the fragments. Where examined, these rocks are grey-green, and are composed of a greenish chlorite matrix, which generally constitutes up to 30 percent of the rock. This matrix contains felsic to intermediate and mafic fragments. The fragments are predominantly bomb-size (over 64 mm) with minor lapilli and ash sizes. Most of the fragments are vesicular and/or spherulitic. Based on fragment sizes and proportions, coarse-grained to medium-grained and medium- to fine-grained flow breccias are recognizable in the map area.

AQUAGENE TUFFS

These units are commonly thin, average about 1 m in thickness, and are composed of fine-grained mafic bands approximately 2 cm thick, and are separated by carbonatized quartzofeldspathic laminae less than 5 mm thick. About 1.5 km southwest of Klob Lake, the aquagene tuffs occur as interflow units in the area adjacent to pillow and flow breccias. In outcrops located 3.2 km southwest of Klob Lake, angular fragments of aquagene tuffs were observed in the flow breccia unit. Fragments larger than ash size (i.e. greater than 2 mm) were not recognized in the field, or under the microscope. A complete chemical analysis of one sample (sample 5) is presented in Table 3.

PYROCLASTIC ROCKS

Coarse fragmental mafic to intermediate rocks are absent in the map area. Several interflow banded tuff units ranging in thickness from a few centimetres to several tens of metres occur throughout the mafic to intermediate mafic flows. Field and laboratory studies suggest a pyroclastic origin. In outcrop, the tuffs are grey-green. The bedding is usually evident being composed of alternate layers of biotite-amphibole-chlorite and quartz-feldspar layers; no fragments larger than ash size (less than 2 mm) were recognized (Photo 3) in the field or in thin section studies. The grain size and mineralogy is variable, but less altered brecciated tuffs consist of anhedral to subhedral grains of amphibole, chlorite, biotite, feldspar, and quartz, with minor amounts of epidote, sericite, carbonate, magnetite, and other opaque minerals. The amphibole and plagioclase grains are generally elongated, and were probably produced by secondary growth. The groundmass is commonly chlorite and is composed of chlorite, quartz, carbonate, epidote, biotite, and opaque minerals. Chemical analysis of one sample (sample number 4) is presented in Table 3.

UNSUBDIVIDED MAFIC TO INTERMEDIATE METAVOLCANICS

Several schistose rock types have been produced by the deformation and metamorphic or metasomatic alteration of the mafic to intermediate metavolcanics. These are chlorite schists, coarse-grained massive hornblende schists,

TABLE 3 | CHEMICAL ANALYSES OF MAFIC TO INTERMEDIATE AQUAGENE AND BANDED TUFFS, KLOB LAKE AREA.

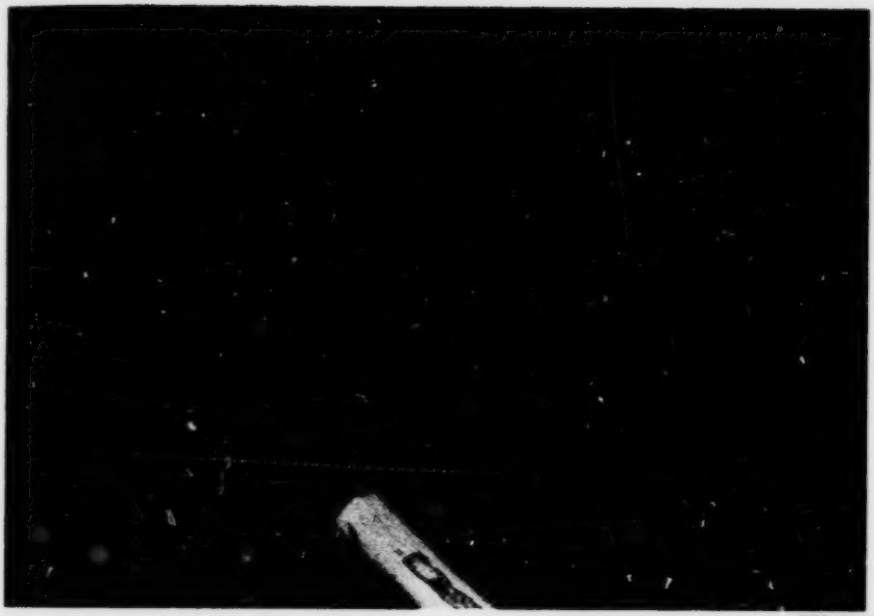
No. on Figure*	Sample Number	SiO_2	Al_2O_3	Fe_2O_3	FeO	MgO	CaO	Na_2O	K_2O	H_2O^+	H_2O^-	CO_2	TiO_2	P_2O_5	S	MnO	Total	SG	Field Lithology
4.	9A-061	49.40	14.60	2.80	11.50	5.06	9.56	2.20	0.31	0.75	0.38	0.85	1.12	0.10	0.04	0.35	99.02	3.06	Banded tuff.
5.	9A-506	56.20	16.30	3.42	4.91	4.55	8.12	2.61	0.13	1.94	0.29	0.28	0.87	0.15	0.01	0.12	99.90	2.87	Aquagene tuff.

CALCULATED ROCK NAMES (AFTER JENSEN 1976)

4. Tholeiitic Basalt.
5. Calc-Alkaline Basalt.

* See Figures 2 and 3.

Sample 4 is not plotted on Map 2469, back pocket.



OGS 10 610

Photo 3–Altered biotite-amphibole-chlorite bands with quartzofeldspathic units set in a well-bedded tuff outcrop. Garnets are developed in the lower right corner of the photograph. Metasomatic or deformation features are defined by a strongly chloritic zone in the top right corner. Folds are restricted to the left edge of the photo. From outcrops located 3.6 km southwest of the western end of Klob Lake.

hybrid quartz-plagioclase-biotite rocks, highly schistose and lighter coloured banded or massive rocks, and carbonatized and silicified zones mainly located astride granitic contacts. Also, mafic to intermediate, porphyritic rocks with quartz and/or feldspar phenocrysts are often found associated with, but cross-cutting all the mafic to intermediate metavolcanics. These rocks may be of flow, intrusive, or tuffaceous origin, but a lack of distinguishing criteria makes it difficult to classify them. Chemical analyses of unsubdivided mafic to intermediate metavolcanics are presented in Table 4.

Intermediate to Felsic Metavolcanics

In the map area, the felsic to intermediate metavolcanics compose less than 5 percent of all the metavolcanics and are restricted to the southwestern part of the map area. Pyroclastic and porphyritic quartz-feldspar bodies possibly of a subvolcanic origin, are distinguished from each other.

TABLE 4 | CHEMICAL ANALYSES OF UNSUBDIVIDED MAFIC TO INTERMEDIATE METAVOLCANICS, KLOB LAKE AREA.

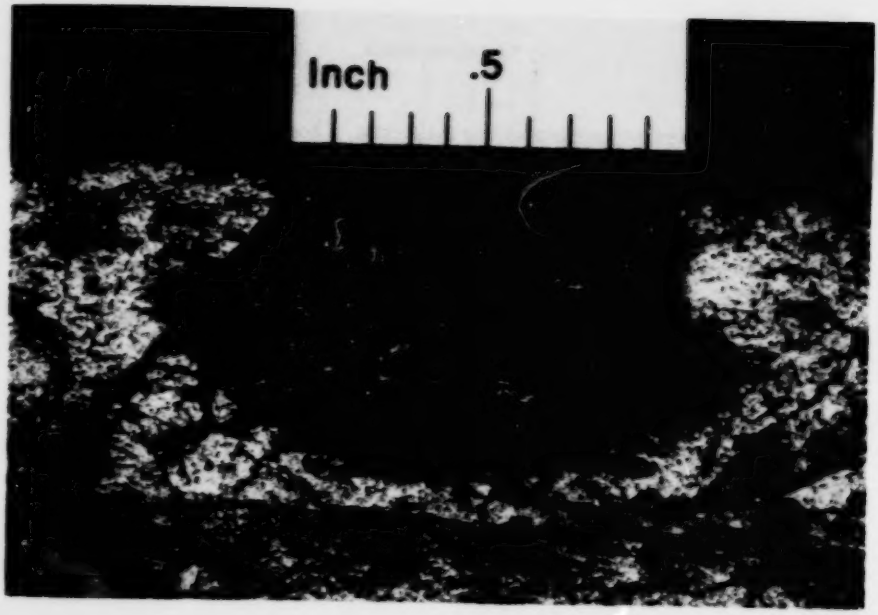
No. on Figure*	Sample Number	SiO_2	Al_2O_3	Fe_2O_3	FeO	MgO	CaO	Na_2O	K_2O	H_2O^+	H_2O^-	CO_2	TiO_2	P_2O_5	S	MnO	Total	SG	Field Lithology
7.	9A-542	54.60	16.80	1.58	4.41	6.26	7.29	3.86	0.78	1.89	0.30	0.23	0.87	0.07	0.01	0.10	99.05	2.86	Silicified Undifferentiated Volcanic
10.	9A-613	53.60	14.60	2.18	8.57	5.10	9.44	2.90	0.12	0.85	0.28	0.64	1.11	0.11	0.12	0.24	99.86	2.98	Sheared Volcanic
12.	9A-548	55.80	14.60	0.93	5.57	6.29	6.28	6.18	0.15	1.61	0.30	1.41	0.67	0.15	0.02	0.15	100.11	2.82	Undifferentiated Volcanic

CALCULATED ROCK NAMES (AFTER JENSEN 1976)

7. Calc-Alkaline Basalt.
10. Tholeiitic Basalt.
12. Altered (soda-rich) metavolcanic.

* See Figures 2 and 3.

Note: For field location see Map 2469, back pocket.



OGS 10811

Photo 4–Possible accretionary lapilli consisting of light and dark lapilli. Note that the dark lapilli are rimmed with a light oblong sphere, probably the outer limit or shell of accretion. The lapilli-tuff occurs as local interbeds in wacke-mudstone units, near chert-magnetite zones. From outcrops in the southwestern corner of the map area located 2.4 km due west of the middle of Hoiles Lake.

Pyroclastic Rocks

Two thin bands of pyroclastic rocks, approximately 3 to 4 m wide, were examined at 2 localities in the southwestern corner of the map area. A pyroclastic origin was assigned to these felsic to intermediate outcrops of tuff, lapilli-tuff, and/or lapillistone. This assignation was done on the basis of 1 single type of fragment, the similarity between matrix and fragments, and the absence of vesicular and/or spherulitic pillow fragments. In outcrops located 1.5 km south of Klob Lake, these pyroclastic rocks contain lensoid lapilli-size fragments set in a grey-green to white sericite-chloritic fine-grained matrix. All the fragments are of similar composition (quartz porphyry) and are light, porphyritic, and are possibly volcanic in origin. A unique outcrop of accretionary lapilli (Photo 4) is exposed in the southwestern corner of the map area as interbeds within the metasediments located 2.4 km due west of the middle of Hoiles Lake.

Subvolcanic Rocks

In the southwestern corner of the map area, a boss of quartz (with or without feldspar) porphyry is intrusive into the mafic to intermediate flows of the area, and is a calc-alkaline rhyolite (sample 11, Figure 2). The rock consists of visual quartz and plagioclase; no other visible minerals are visible with the naked eye. Under the microscope the rock consists predominantly of zoned plagioclase laths up to 10 mm long, which are clouded with sericite/saussurite alteration, and elongate large subrounded phenocrysts of quartz (3 to 5 mm long). Very minor amounts of chlorite, sericite, and opaque minerals also occur.

Numerous other dikes of quartz and/or feldspar porphyry, felsic dikes, and altered equivalents (sericite schists) which average 3 to 5 mm in width, crosscut the felsic and mafic metavolcanics. Where examined, the porphyritic texture is common (except for felsic dikes). The origin of the metacrysts is open to a number of interpretations. The metacrysts could be primary phenocrysts, porphyroblasts or fragments. These porphyritic dikes probably formed feeder zones through which the volcanic pile was extruded. This statement is based on the following features, xenoliths of mafic metavolcanics, chilled margins, porphyritic and granophyric textures, and vesicular textures. In thin section, the porphyries are seen to contain phenocrysts of quartz with or without sodic plagioclase. The phenocrysts are scattered in a groundmass of chlorite, quartz, carbonate, muscovite, epidote, and opaque minerals. Chemical analyses of the samples of a quartz porphyry from a possible subvolcanic boss are listed in Table 5.

METASEDIMENTS

The metasediments consist predominantly of clastic units with minor chemical strata. On Map 2469, back pocket, the clastic and chemical metasediments have not been mapped as separate units, but are described separately in this report.

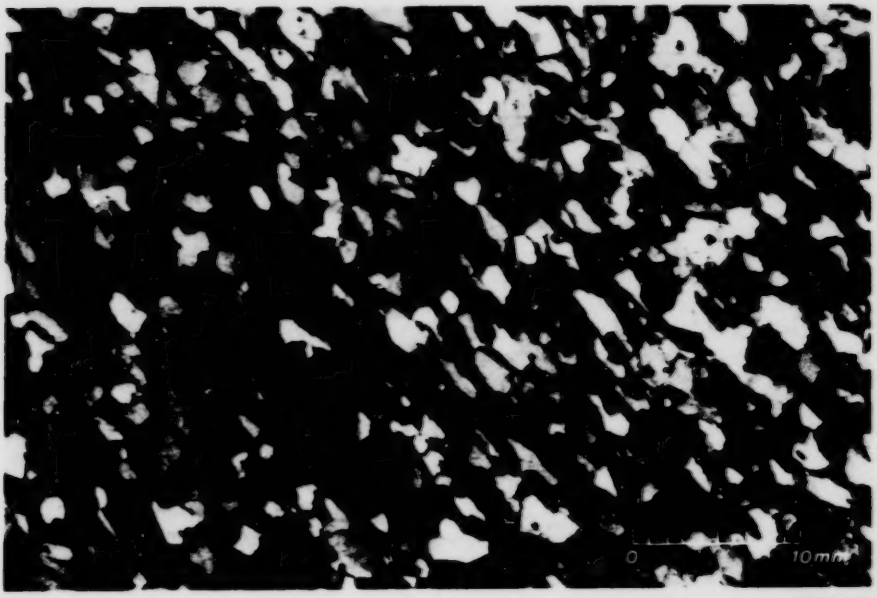
Classification of the metasediments is based upon the prevalent size of the epiclastic fragments and constituent matrix in the rocks. In the map area, it is generally inapplicable because of the extensive metamorphism of the rocks (Photo 5). In the less altered and recrystallized metasediments, wacke, and mudstone together with conglomerate are recognizable, and seem to be interbedded with each other throughout the map area. The metasedimentary unit is about 8 km wide in the area mapped, but is interbedded with the southern metavolcanic unit, southwest of and in part within the south-central part of the map area. Several exposures consist of magnetite ironstone interlayered with chert (oxide-facies iron formation) and pyrite-pyrrhotite ironstone containing graphite (sulphide facies iron formation). These rocks occur as distinct units but are usually interbedded with the clastic metasediments and less commonly with the metavolcanic and gabbroic rocks. The ironstone-bearing (iron formation) units can be extrapolated from aeromagnetic survey maps onto a geological map as continuous horizons.

TABLE 5 | CHEMICAL ANALYSIS OF A QUARTZ PORPHYRY FROM A POSSIBLE SUBVOLCANIC BOSS..

No. on Figure*	Sample Number	SiO_2	Al_2O_3	Fe_2O_3	FeO	MgO	CaO	Na_2O	K_2O	H_2O^+	H_2O^-	CO_2	TiO_2	P_2O_5	S	MnO	Total	SG	Field Lithology
11.	9A-653	78.20	12.90	0.59	0.75	0.43	0.78	3.88	1.56	0.59	0.33	0.28	0.22	0.04	0.02	0.01	100.58	2.68	Quartz porphyry

CALCULATED ROCK NAMES (AFTER JENSEN 1978)
11. Calc-Alkaline Rhyolite.

* See Figures 2 and 3.



OGS 10 612

Photo 5–Photomicrograph showing recrystallized sandstone. Quartz and feldspar are equigranular, and biotite, which shows a strong preferred orientation, may represent recrystallized matrix. From outcrops located on the East Road, 1.6 km west of the eastern map-boundary of the map area.

Clastic Metasediments

The clasts in the less altered and less recrystallized rocks indicate that the predominant rocks of the clastic metasediments are sandstones (feldspathic wacke). These rocks have a range in grain size from 0.05 to 2 mm. A few rock pebbles are in excess of 20 mm and mudstones having a range less than 0.05 mm according to the grain size scale of Young (1967) occur in these rocks. Zones of very coarse grained (pebbly or gritty) feldspathic wacke (1 to 3 mm) and granule to pebble conglomerate occur near the northern contact of the metasediments with the northern metavolcanic unit. Metamorphosed equivalents of these rocks, such as argillite, slate, schist, and paragneiss occur in areas of intense metamorphism [the specific metamorphosed equivalents are not shown on Map 2469, back pocket]. A progressive metamorphic change in the metasediments takes place, turbidites gradually change into garnetiferous biotite-muscovite-paragneiss. This gneiss is commonly intruded by a leucosome composed of garnetiferous muscovite pegmatite. The rock may change into an inhomogeneous diatexite. This stage occurs outside the map area, along the Caramat Road (Highway 625), the South Pagwachuan Lake Road, and also along the private access road of Kimberly-Clark Limited to Terrace Bay from Longlac (K.D.

Card, Geologist, Geological Survey of Canada, Ottawa, personal communication, 1979).

SANDSTONES

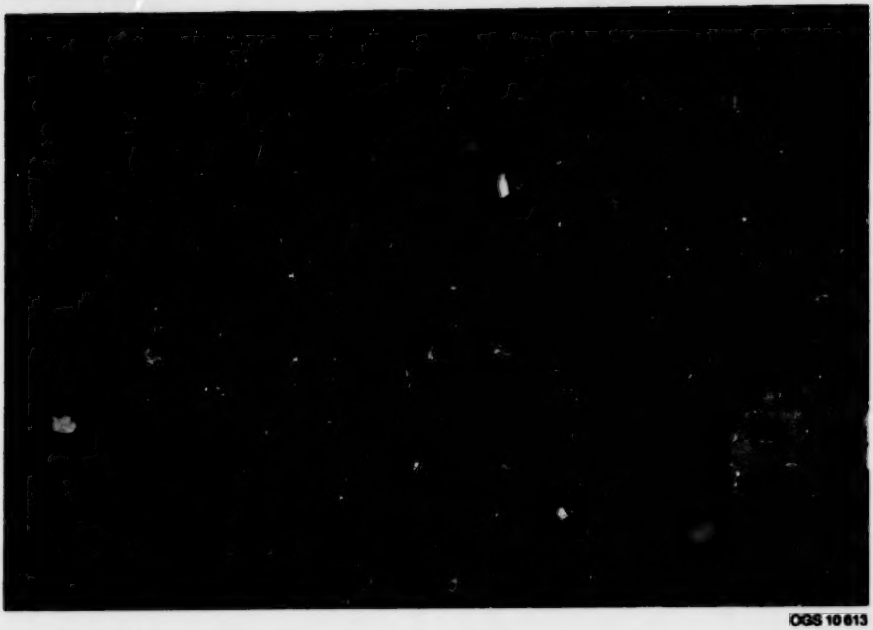
The sandstones cannot be classically subdivided because of the extensive amount of recrystallization suffered by the rocks in the map area. The classification system in use (Young 1967) is based on the visual estimate of the percent content of the fine-grained matrix present in any rock. During the field mapping, metasediments of the Klob Lake area, and the less altered and recrystallized sandstones were mapped as interbedded wacke and mudstone. This nomenclature was generally supported by the microscopic examination of less recrystallized specimens in which the majority of the most coarse grains range in size from 0.08 to 3 mm and the most small grains are less than 0.05 mm. In these size ranges, a framework of predominantly equigranular quartz and feldspar grains cemented by a fine-grained matrix of elongate twinned biotite crystals, chlorite, amphibole, epidote, quartz feldspar, calcite, sericite, and magnetite is evident. The percentage of the matrix ranges from 13 to 40 percent of the volume of the rock. The matrix consists of variable proportions of quartz, feldspar, and labile fragments. The sandstones may have been arkosic wackes (Young 1967).

In outcrop, the wackes are characteristically medium to coarse grained, intricately grade into fine-grained mudstones (Photo 6); and individual beds may vary greatly in thickness. These beds range from a few centimetres to a maximum of 30 m in thickness, but are on average 30 cm thick. The interbedded and graded wacke-mudstone beds are occasionally crossbedded. Thin section examination reveals that the wackes consist of a framework of subangular to subrounded equigranular grains of quartz, plagioclase, with or without metamorphic almandine, and lithic clasts, which are cemented by biotite, chlorite, amphibole, epidote, sericite, and opaque minerals (Photo 7).

In the less metamorphosed wackes, graded bedding and crossbedding are usually preserved, but in the more gneissic types, these features are destroyed; the rock is a garnetiferous gneiss containing quartz, plagioclase, and biotite. In thin section, the gneissosity is revealed to be defined by the change of biotite and plagioclase grains into elongate, frequently twinned crystals that are equigranular.

Units of the wackes occur near the East Road, southeast of Klob Lake; and in the southwestern corner of the map area. Near the East Road, the wacke is gritty or very coarse grained (1 to 3 mm), and may contain clasts 3 to 50 cm in size (Photo 8). Some of the clasts are granitic, but most are probably volcanic in origin. In thin section, the coarsest grains are about 1 to 2 mm in diameter. Several grains, (about 5 percent) are more than 20 mm in diameter. A framework of subrounded to rounded grains of quartz (20 to 50 percent), twinned albite (35 to 50 percent) and lithic clasts, are suspended in a partly to completely recrystallized matrix consisting mainly of mica with quartz, feldspar, sericite, calcite, opaque minerals, apatite, and epidote.

In the southwestern corner of the map area, an outcrop of interbedded fine-



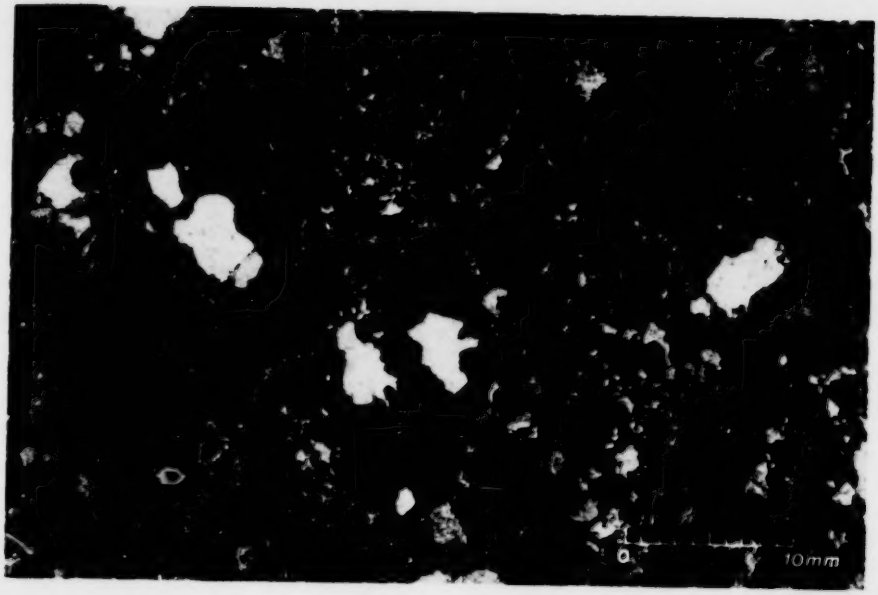
OGS 10 613

Photo 6–Graded sandstone-mudstone beds that are rhythmically interlayered. This feature is typical of most sandstone-mudstone outcrops in the map area. Outcrops located 1.2 km northwest of the northern end of Hoiles Lake.

to medium-grained, graded beds of sandstone and mudstone with interbedded magnetite ironstone is exposed. The wacke-mudstone layers contain isolated zones of spherical to ellipsoidal clots 2 to 5 mm in diameter. These clots are distributed in a very fine grained matrix consisting of quartz, feldspar, chlorite, amphibole, epidote, mica, and sericite (Photo 8). The clots are predominantly made up of quartz and feldspar grains with intergrowths of mica, chlorite, and sericite. In view of their peculiar composition and texture, these "clots" may either be altered metacrysts or altered rock fragments. These features are believed to be altered clasts, and not large crystals, such as garnet or staurolite that might have developed by metamorphism. This is because the clots contain a considerable amount of mica, and the clots are elongate.

MUDSTONES

The mudstones form the upper subunits of the intimately graded and interbedded wacke-mudstone beds that may occasionally show some bedding. The mudstones have a finer grained texture and darker colour than wacke. The



OGS 10 614

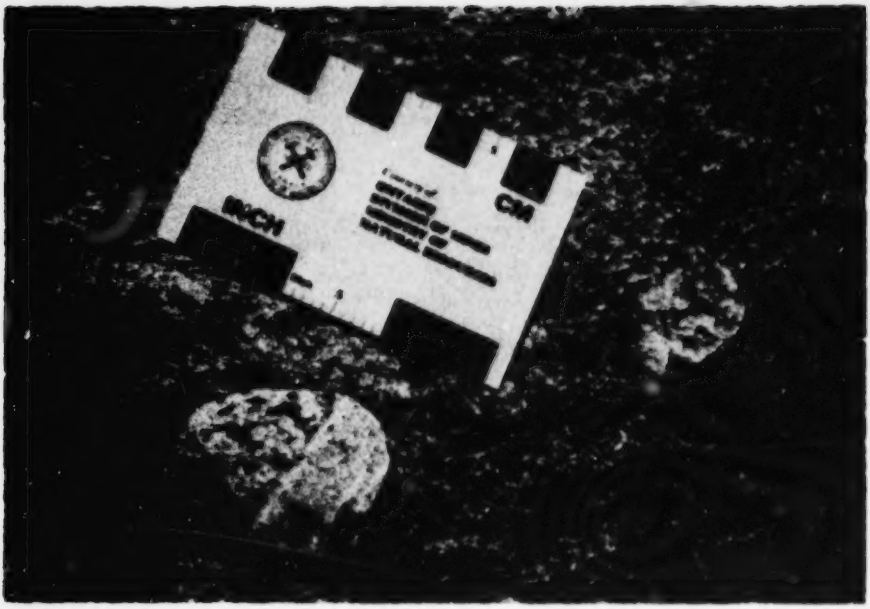
Photo 7–Photomicrograph of metawacke to show primary sedimentary texture. Large quartz and feldspar grains cemented by a micaceous matrix. Outcrop located 2 km southeast of the middle of Klob Lake.

mudstone, however, is generally thinner than that of the wackes and rarely exceeds 30 cm in thickness. The bands have an average width of 10 cm.

The composition and texture of the matrix and framework of the mudstones is identical to that of the wackes, except that the grains of quartz and feldspar in the framework (less than 25 percent) range from 0.1 to 0.5 mm, and the matrix (less than 0.06 mm) consists of biotite, chlorite, calcite, epidote, sericite, apatite, quartz, feldspar, and opaque minerals. The bedding is reflected by the distribution and grain size of rounded to subrounded grains of quartz, feldspar, and by varying proportions of mafic minerals.

In 1 outcrop on the eastern shore of a little lake located east of Gabbro Lake, metacrysts of cummingtonite are distributed throughout the mudstone and interbedded wacke. These metacrysts form approximately 30 percent of the rocks and were mapped in the field as staurolite. In these rocks, the matrix (45 percent) consists of cummingtonite and hornblende (20 percent), epidote, chlorite, opaque minerals, biotite, quartz, and feldspar (25 percent). The framework (55 percent) consists of quartz (25 percent) and plagioclase (20 percent) grains with secondary cummingtonite metacrysts (10 percent).

The mudstones are recognizable north of Pagwachuan Lake, whereas south



OGS 10 815

Photo 8–"Easter egg outcrop" showing coarse-grained granitic clasts and coarse sand grains. Note the largest pebble is cut by an aplite dike. From polymictic pebble conglomerate outcrops located west of the East Road, 2 km southeast of Klob Lake. These rocks may be more appropriately described as conglomeratic grit (MacDonald 1938) because the matrix is generally coarser than 2 mm. Pebbles, though not illustrated in this photo, can form as much as 15 percent of the rock.

of the lake, the original textures are modified by recrystallization, and any sedimentary structure is dominated by gneissosity. In areas close to the northern shore of Pagwachuan Lake, the fine-grained mudstones are distinguished from tuffs in general only with difficulty. The mudstones are thinly laminated, fine-grained argillaceous rocks that form the upper parts of wacke-mudstone graded beds, and are distinguished from the tuffs by bedding plane foliation and the degree of induration. The mudstones are dark grey to black on weathered surfaces, and display varying colours ranging from dark brown or grey to black on fresh surfaces.

CONGLOMERATES

Several outcrops of conglomerate including the only one mapped by MacDonald (1938, p.27) were examined by the field party. These outcrops are all located 2 km southeast of Klob Lake. A conspicuous polymictic pebble conglom-

erate is exposed in one outcrop located on the East Road. This conglomerate contains a variety of pebble types having maximum lengths of 10 to 15 cm; these are set in a fine-grained chlorite matrix. Fine-grained light green possibly mafic, intermediate, and felsic volcanic pebbles are the commonest type of pebble. Also, there are pebbles of quartz, porphyritic rocks, and a dark flinty rock, possibly chert. Most of the pebbles are severely deformed and elongated. The origin of the rock is usually difficult to discern.

In outcrops about 400 m east of the area, the conglomerate consists of coarse and angular grains of quartz and albite which form the greater part of the rock. These grains are set in a fine-grained matrix of quartz, feldspar, biotite, chlorite, opaque minerals, sericite, and calcite. A few pebbles with a maximum length of 10 to 15 cm occur in the gritty rock; these fragments are probably both granitic and volcanic in origin.

The conglomerate exposures are associated with coarse-grained sandstone. These exposures occur near the northern limit of the metasediments and near the contact with the metavolcanics. Conglomerate and coarse-grained sandstones and mudstones, and numerous narrow bands of magnetite ironstone are common in the sparse outcrops that occur in this area.

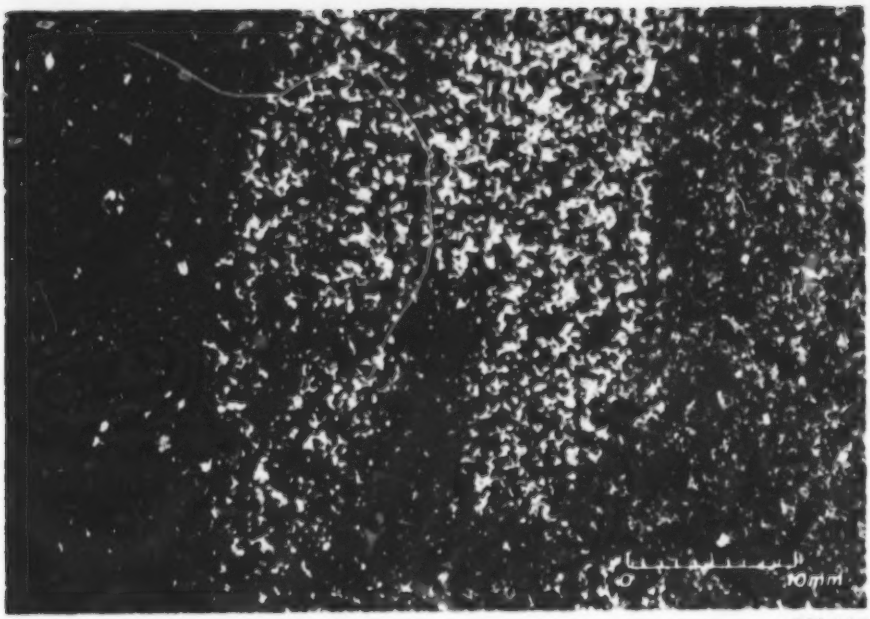
UNCLASSIFIED CLASTIC METASEDIMENTS

Some of the clastic metasediments are altered and severely deformed. In the field, these rocks may be interbedded with banded garnetiferous quartz-feldspar-amphibole schists where examined. These rocks occur as thinly laminated, distorted, and boudinaged belts of schist with mica and chlorite draping around grains of quartz and feldspar. In thin section, these rocks are seen to be very altered, and to consist essentially of biotite, hornblende, quartz, and feldspar with minor chlorite and sericite. Other minerals include epidote, muscovite, and opaque minerals. The feldspars are almost completely altered to sericite and saussurite. The quartz grains may be rotated or distorted and broken, and biotite grains remain as chloritic pseudomorphs rimmed or penetrated by chlorite. In the quartz, feldspar, and biotite grains, a pronounced foliation paralleling the long axis of the grains is displayed, as well as a mortar structure in which minute mica-chlorite-sericite grains are draped around the larger grains.

Even though the origin of these rocks is in doubt, inclusion of them with the metasediments was made for the following reasons:

1. The mineralogical composition of the rocks approximates that of the wackes and mudstones, except for the abundance of chlorite, sericite, and biotite.
2. Lamination is recognizable on examination of thin sections.
3. The rocks are interbedded with wackes and mudstones in some parts of the map area.

The unclassified clastic metasediments are generally distributed adjacent to the major faults of the map area, but a fairly continuous unit (3e, 3d; 1k) is located between Pyro Lake and Gabbro Lake, south of Adel Lake. In this area, the chlorite-mica schists [not shown on Map 2469, back pocket] are interbedded



OGS 10 616

Photo 9–A peculiar texture consisting of rock fragments (centre) which look like recrystallized metamorphic porphyroblasts, in wacke-mudstone layers from outcrop located in southwestern part of the map area approximately 2 km west of Hoiles Lake.

with a banded metasediment or tuff which consists of hornblende-rich laminae (2 to 3 cm wide) with hornblende needles reaching 1 to 2 cm in length and light quartzofeldspathic laminae (2 to 3 cm wide). The 2 types of laminae are scattered with up to 5 percent metacrysts of almandine which attain diameters of 2 cm. Several rock fragment types can be recognized in these rocks.

Chemical Metasediments

IRONSTONE

Ironstones in the map area are of two types. In one type, continuous layers of magnetite ironstone are interlayered with chert (oxide facies). In the other type, pyrite, and pyrrhotite ironstones are intimately associated with chert and graphite (sulphide facies).

Units of magnetite ironstone interlayered with chert are uncommonly more than 5 cm wide, and occur as interbeds within wacke, mudstone, and con-

OGS 10617

Photo 10–Narrow oxide-facies (magnetite ironstone-chert) layers (dark-white units average less than 2.5 cm) occurring as interbeds within wackes and mudstones. From outcrops located 1.2 km northwest of the top end of Hoiles Lake.

glomerate in zones up to 10 to 15 m wide (Photo 10). These zones are continuous, can be outlined by aeromagnetic survey results (Ontario Department of Mines-Geological Survey of Canada 1963a, 1963b, 1963c, and 1963d), and are located in the southwestern corner of the map area, especially around the Hoiles Lake area, and near Hoiles Creek. The principal minerals of the magnetite-rich units are euhedral grains of magnetite, a mosaic of crystalline and cryptocrystalline quartz, chlorite, and biotite. In the individual bands, the beds may be locally thickened and thinned by deformation and may display spectacular patterns of drag folds. The iron content varies between 18 to 30 percent (assay by Geoscience Laboratories, Ontario Geological Survey, Toronto).

The pyrite and pyrrhotite ironstone layers are also narrow, and are interbedded with all metavolcanics and metasediments of the map area, in zones up to 325 m. These zones can also be traced by aeromagnetic survey results, or by trenching. The best exposures of sulphide-facies iron formation in the map area are located in the area east of Adel Lake, north of the fault along Adel Lake. In this property, which is owned by Albert Onesime (11; *see* Map 2469, back pocket), a surface exposure 1.3 km long by 325 m wide was outlined by trenching and contained pyrite, pyrrhotite, with or without magnetite, chert, graphite, sericite, talc(?), and garnet. Assays of copper, gold, and silver content were also performed. This exposure is indicated by aeromagnetic survey (*see* account on "Albert Onesime (11)) to continue eastwards to Pyro Lake and beyond the limits of the map area. The iron content varies between 25 and 30 percent (assay by Geoscience Laboratories, Ontario Geological Survey, Toronto). Assessment file reports also indicate that several unexposed sulphide-facies iron formation zones were outlined by recent drilling exploration surveys. These zones are reported to be graphitic zones containing massive to disseminated pyrite, pyrrhotite, with or without magnetite, chalcopyrite, arsenopyrite, and sphalerite. In addition, cherty ironstone with only trace to low values of base metals were intersected by this drilling (Assessment Files Research Office, Ontario Geological Survey, Toronto).

FERRUGINOUS CHERT, CHERT, GRAPHITE SCHIST

These rocks contain proportions of common iron minerals that average less than 33 percent, and include all those ferruginous rocks that are excluded from ironstone. Several outcrops of ferruginous chert and chert occur in the exposures of oxide- and sulphide-facies iron formation previously described.

Graphite schist was observed in only one outcrop in trenches located east of Adel Lake (*see* Albert Onesime (11), Map 2469, back pocket). Several diamond-drill intersections are given later in this report; the rocks intersected have no outcrop exposure, and are described under the individual property descriptions found in the section "Description of Properties".

INTRUSIVE ROCKS

Metamorphosed Intermediate to Mafic Intrusive Rocks

In the map area, the intermediate to mafic intrusive rocks are intruded into the metavolcanics and metasediments forming dikes or sills that are mostly too small to show at the map scale. Three bodies which are less than 1 km^2 in area, however, are important because of the following reasons:

1. All 3 bodies occur within metasediments at or near the southern contact of the metavolcanics.
2. All 3 are located near sites of past gold exploration activity, and

are associated with sulphide-facies iron formation.
3. All 3 have a gabbroic or dioritic composition. Texturally, the bodies are progressively more sheared towards the margins, so that the grain-size decreases, and highly sheared chlorite schists are developed.

GABBRO, DIORITE BODIES

These rocks have a coarse-grained texture, and have dark-grey to black surfaces where exposed. Due to metamorphism and deformation it is difficult, if not impossible to identify them as intrusive, because they resemble coarse-grained mafic to intermediate metavolcanics. Evidence of intrusion, such as chilled contacts, and the presence of country-rock xenoliths, is not common.

The distinction between gabbro and diorite is based on plagioclase composition and the amount of quartz and potassic feldspar present. The rocks in the area are difficult to classify as diorite or gabbro because alteration prevents the accurate determination of the plagioclase composition.

Thin section examination reveals that altered varieties have ophitic to subophitic textures, and that only pseudomorphs of the primary mineralogy are present. The rocks are composed of plagioclase (25 percent), actinolite-tremolite and hornblende (30 to 35 percent), and minor amounts of biotite, epidote, chlorite, calcite, quartz, muscovite, sericite, and opaque minerals.

In the first body, located on the southern shore of Paglamin Lake, the contacts between the body and the Paglamin Lake Stock are highly sheared and the northern contact contains narrow quartz veins which are mineralized with gold and iron sulphide minerals.

The second body is located north and west of Snoopy Lake. The metasediments that the body intrudes, and also the metavolcanics to the north, are highly sheared. Bands of sulphide-facies iron formation nearby, reported to be auriferous (Assessment Files Research Office, Ontario Ministry of Natural Resources, Toronto), are recognizable in the sheared metasediments and metavolcanics. In this body, laths of hornblende up to 1 cm in length are developed, and the rock composition appears to be that of a hornblende gabbro.

At the third gabbroic-dioritic intrusive body located at the southwestern corner of the map area, the rock is similar in appearance to the second intrusive body. Intrusion flow layering, however, is well developed in the body, and the rock is progressively more sheared towards the borders such that the gabbroic texture is lost and chlorite schists are developed. The metavolcanics are not exposed in the vicinity of the intrusion. In the nearby outcrops of the metasediments, regular and continuous magnetite-rich bands have an average width of about 2.5 cm and occur in a zone up to 15 m wide.

MIGMATITES

The metasedimentary sequence is progressively changed from interbedded chloritic (altered) wacke and mudstone or phyllite in the north, into garnet-

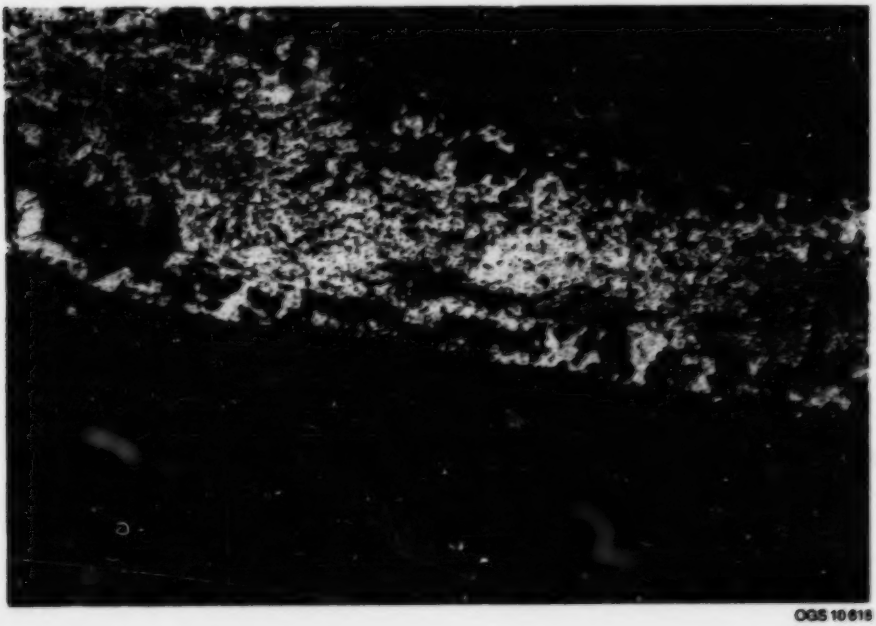


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Photo 11–Pegmatitic leucosome phase intruded into the recrystallized wacke-mudstone paleosome. From outcrop located on a logging road, 1.2 km east of Agate Bay Camp on Pagwachuan Lake. Note the pencil sharpener is about 2.5 cm long.

biotite paragneiss with or without muscovite and amphibole. These rocks are extensively intruded by garnet-muscovite pegmatite leucosomes (Photo 11). Further south, the paragneisses become more migmatized until only narrow blocks and layers of paragneiss survive in coarse-grained quartz monzonite leucosome.

PARAGNEISS AND METATEXITIC MIGMATITE

Foliated to gneissic dark grey to light brown weathered micaceous rocks having a probable wacke bulk composition occur along the southern and northern shores of Pagwachuan Lake. These rocks have undergone migmatization to varying degrees, but some of them retain traces of sedimentary bedding. All these rocks are also extensively intruded by dikes and sills of white-weathered, medium-grained to pegmatitic almandine-muscovite mobilizate ranging in composition from granite to quartz monzonite. Texturally, the biotite-almandine gneiss grades from bedded, fine-grained schist and gneiss, into massive, medium- to coarse-grained gneiss. Subrounded to subangular grains of quartz

are usually the dominant mineral in thin sections, but relatively fresh plagioclase may equal or exceed quartz in volume. Other mineral constituents include biotite, almandine, chlorite, and minor amounts of epidote, opaque minerals, and muscovite.

In areas south of Pagwachuan Lake, the biotite gneisses are mixed with 20 to 50 percent white-weathered, medium- to coarse-grained leucocratic mobilizate having a quartz monzonite composition (*see* Figure 4). These rocks resemble plutonic granitic rocks, but are different because almandine may be present, and blocks of the paleosome may also occur in them. A typical specimen consists of quartz (about 35 percent), microcline (about 30 percent), plagioclase (25 to 30 percent), muscovite (5 to 10 percent), biotite (1 to 5 percent), and chlorite.

DIATEXITE

The more advanced stages of anatexis are located outside the map area along Caramat Road (Highway 625), South Pagwachuan Lake Road, and the Kimberly-Clark Road to Terrace Bay. Only a few blocks and layers of paleosome survive, and the outcrops are characterized by medium- to coarse-grained inhomogeneous and homogeneous diatexite having a composition ranging from tonalite to quartz monzonite. These rocks were not extensively studied in the present study because they are exposed beyond the confines of the map area.

INTERMEDIATE TO FELSIC PLUTONIC ROCKS

Three composite post-metamorphic, possibly syntectonic, granitic stocks and associated pegmatitic and granitic dikes are intruded into the metavolcanics, metasediments, and metagabbroic rocks. The batholithic rocks together underlie about 30 percent of the map area and are cut by smaller hypabyssal late stage intrusive dikes.

In the field, all granitic rocks collected were stained using variations of the methods of Chayes (1952), and of Solar and Fahey (1972). The rocks were first immersed in dilute hydrochloric acid to eliminate excess calcite, were treated with hydrofluoric acid to etch the surface, and then with sodium cobaltinitrite to stain the cut surface. The samples were then classified using the alkali feldspar to total feldspar ratio and the amount of quartz present (after Ayres 1972). The rock names were then verified by subsequent chemical and petrographic analyses (Figure 4, Table 6).

The granitic stocks, 2 of which are only partly in the map area, are located around Wee David, Paglamin, and O'Meara Lakes. O'Meara Lake is the nearest large lake located outside the map area. For ease of description, these stocks will be referred to in the report as the Wee David Lake, Paglamin Lake, and O'Meara Lake Stocks.

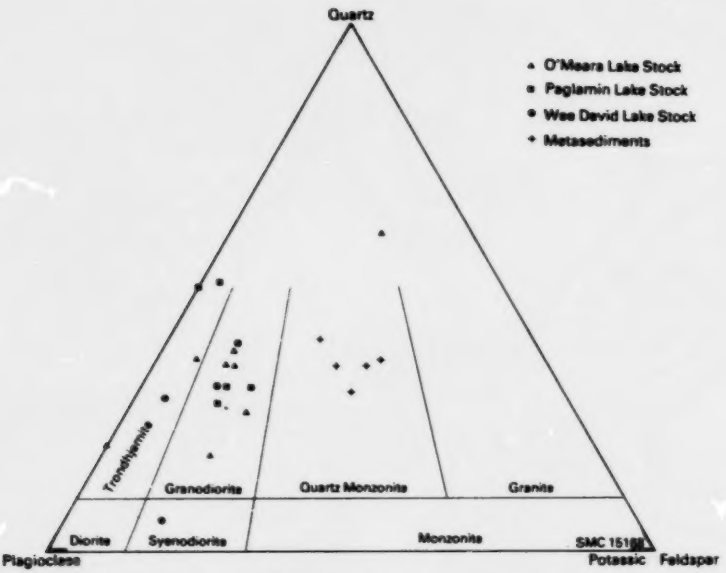

Figure 4–Quartz-Plagioclase-Potassic Feldspar Plot of Granitic Rocks with Leucosome of Metasedimentary Migmatite.

Wee David Lake Stock

The Wee David Lake Stock is a massive to foliated body comprising pale grey-weathered, medium- to coarse-grained equigranular to porphyritic rocks. These rocks are composed of several phases that range in composition from trondhjemite to granodiorite. At the margins of the metavolcanics, tongues of granitic rocks intrude and assimilate the metavolcanics, and the predominant rock type is diorite and/or syenodiorite. Right at the contact with the metavolcanics, an agmatitic texture is common, in which abundant mixed angular mafic xenoliths and pods of the dioritic phases are displayed (Photo 12). This contact phenomenon is best exposed along the Northeast Road where some of the phases were observed to contain disseminated pyrite.

Thin section examination reveals that the rocks from the centre of the stock contain polygonal, frequently undulose and equigranular grains of quartz (25 to 40 percent), twinned and often sericitized-saussuritized plagioclase of undeterminable composition (30 to 55 percent), potassic feldspar with occasional microcline twinning (5 to 15 percent), subhedral laths of bictite (5 to 10 percent), hornblende (up to 15 percent), and minor amounts of muscovite, epidote, sphene, calcite, and opaque minerals. The contaminated rocks at the contacts with the metavolcanics consist of sericitized and poorly twinned pla-

TABLE 6 | CHEMICAL ANALYSES OF ALL THREE GRANITIC STOCKS OF KLOB LAKE AREA.

Sample:	SiO_2	Al_2O_3	Total Fe as Fe_2O_3	MgO	CaO	Na_2O	K_2O	L.O.I.	TiO_2	P_2O_5	MnO	Total	Laboratory Lithology
△ 9A-069	69.30	15.60	2.04	0.91	2.07	6.40	1.73	0.90	0.32	0.12	0.03	98.76	Granodiorite.*
△ 9A-146	73.40	16.50	0.69	0.34	1.45	5.06	2.61	0.50	0.17	0.05	0.01	100.56	Granodiorite.
△ 9A-148	70.90	16.70	0.79	0.39	1.59	5.80	2.09	0.50	0.22	0.06	0.01	98.71	Granodiorite.
⊕ 9A-158	53.10	17.10	8.06	4.29	7.88	4.99	1.62	1.70	0.59	0.22	0.13	98.52	Syenodiorite.
□ 9A-159	69.50	16.20	1.72	0.97	2.74	5.12	2.31	1.20	0.33	0.11	0.03	99.39	Granodiorite.
⊕ 9A-573	50.70	14.70	9.82	6.88	10.40	3.81	1.18	1.40	0.64	0.31	0.19	98.81	Diorite.*
⊕ 9A-584	69.80	16.30	1.87	1.04	2.50	5.22	2.79	0.90	0.29	0.11	0.03	100.04	Granodiorite.*
□ 9A-589	66.00	15.80	3.14	1.82	3.08	4.34	2.96	1.70	0.38	0.11	0.05	98.28	Granodiorite.
△ 9A-669	59.70	15.60	5.59	3.92	4.97	6.04	2.68	0.70	0.61	0.24	0.08	99.61	Syenodiorite.
□ 9A-681	65.40	14.80	3.29	1.89	3.26	4.02	3.04	3.90	0.35	0.12	0.05	98.79	Granodiorite.*

Explanation:
△ O'Meara Lake Stock.
□ Paglamin Lake Stock.
⊕ Wee David Lake Stock.

* Confirms Field Name.

Note: Rock nomenclature follows Ayres (1972).

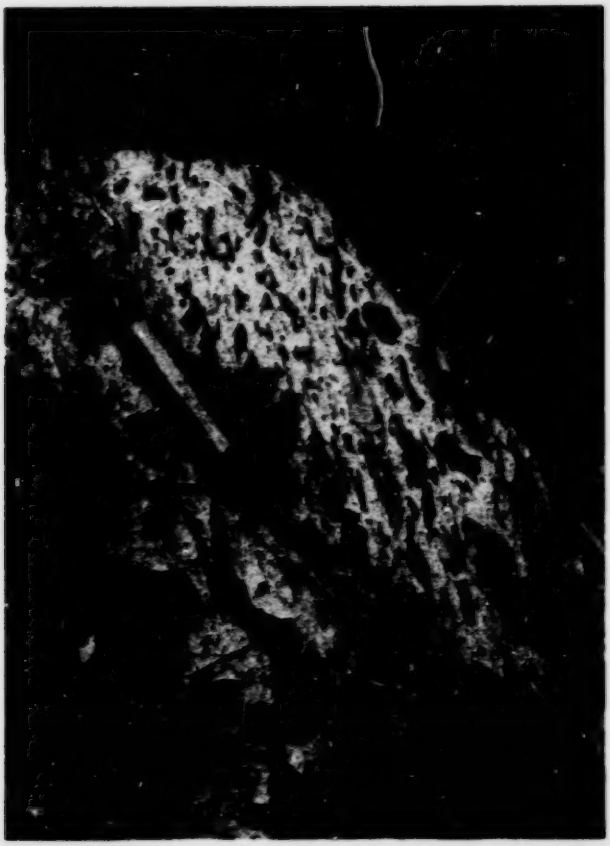

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Photo 12–Agmatite texture at the margin of Wee David Lake Stock, consisting of numerous angular mafic volcanic fragments of variable texture, and subrounded to elongate xenoliths of syenodiorite to diorite phases. From outcrops on the Northeast Road located about 2 km southwest of the western end of Proctor Lake.

gioclase of unknown composition (40 to 50 percent), anhedral and commonly poikiloblastic hornblende (30 to 40 percent), biotite (5 to 10 percent), microcline (up to 10 percent in quartz-poor varieties), recrystallized interstitial small polygonal quartz grains (generally below 5 percent, but up to 10 percent in potash-poor specimens) and minor amounts of epidote, sphene, calcite, chlorite, sericite and opaque minerals.

Granitic sheets, dikes, and veins of variable texture consist of aplite, porphyritic and/or granitic dikes, and quartz veins, possibly later in phase, are associated with the stock and commonly cross-cut the main intrusive body.

The mineralogical composition of the hypabyssal intrusive rocks, except for the quartz veins, may be identical to that of the stock. These hypabyssal rocks are generally too discontinuous and too small to be indicated on Map 2469, back pocket. Texturally, the dikes and veins vary in proportion to their widths. Epidote is usually associated with these bodies.

Chemical analyses of the Wee David Lake Stock are presented in Table 6, and 3 ternary plots based on rock deformations are given in Figure 4.

O'Meara Lake Stock

This stock appears to be uniform in composition and texture in the field, but several phases can be distinguished in the stock upon thin section study. The predominant phase is a medium- to coarse-grained massive to foliated and porphyritic granodioritic rock. In outcrop, the rocks are pinkish grey to white, equigranular to porphyritic, and may contain fine-grained mafic xenoliths with or without fine- to medium-grained clots of more mafic phases of the stock. Several outcrops displaying later dikes, sills, and veins of granitic and pegmatitic dikes and sills, more mafic dikes, quartz veins, and porphyritic dikes also occur in the dominant phase of the O'Meara Lake Stock.

In thin section, the dominant phase of the O'Meara Lake Stock consists of coarse-grained undulose quartz (15 to 35 percent), sericitized and often twinned plagioclase (40 to 55 percent), microcline (10 to 20 percent), hornblende (0 to 7 percent), biotite (0 to 2 percent), with minor amounts of epidote, chlorite, sphene, calcite, apatite, and opaque minerals.

Less dominant phases are usually medium- to fine-grained, massive to foliated, and may also be porphyritic. In outcrop, these rocks are dark grey, and may not be traced for any considerable distance. The rocks range in composition from syenodiorite to trondhjemite and in thin section consist of altered anhedral grains of plagioclase (50 to 70 percent), undulose anhedral grains of quartz (5 to 35 percent), microline (0 to 10 percent), biotite (1 to 2 percent), epidote (2 to 5 percent) with minor amounts of sphene, chlorite, sericite, calcite, zircon, hornblende, and opaque minerals.

Paglamin Lake Stock

This stock is distinctive because it is characterized by blue quartz "eyes"; it displays green, sericitized plagioclase phenocrysts; and it contains mafic fine-grained xenoliths and/or medium-grained inclusions of a more mafic phase which also contains the distinctive blue quartz "eyes".

The Paglamin Lake Stock is relatively uniform in composition because the main phase is composed of granodioritic composition, but the minor mafic phase and sheared variety are of trondhjemitic composition (Figure 4). Texturally, the stock is predominantly massive, but is porphyritic, and slightly foliated zones may be locally present, especially near the borders with the country rocks. In thin section, the rocks of the main phase are seen to be composed of

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Photo 13–Fault breccia texture, shown in middle dark-grey band (perhaps approaching the blastomylonite stage), consisting of broken granitic rock fragments of the country rock, and suspended in a very fine grained to aphanitic groundmass with abundant clinozoisite. From outcrops located 0.8 km west of Pyro Lake. Note that the diameter of the lens cap is 5 cm.

twinned, commonly perthitic microcline potassic feldspar (10 to 15 percent), sericitized, commonly twinned oligoclase-andesine plagioclase (40 to 45 percent), quartz (20 to 26 percent), biotite (12 to 25 percent), epidote (3 to 6 percent), with minor amounts of hornblende, calcite, sphene, and allanite(?). The more mafic trondhjemitic phase consists essentially of the same mineralogy except that plagioclase varies from 10 to 40 percent of the rock, potassic feldspar is as much as 5 percent, and epidote, sphene, hornblende, and allanite(?) may not be present.

The margins of the stock, especially along the southern contact, are characterized by the intrusion of quartz veins with or without feldspar porphyry dikes which are essentially off-shoots from the main stock. These dikes are compositionally similar to rocks of the main stock. They are different, because

1. The feldspars and mafic minerals are altered, and this is shown by an increase in the amounts of calcite, chlorite, and sericite.
2. The blue quartz phenocrysts are not present.
3. A considerable amount of opaque minerals, probably pyrite and pyrrhotite is present in the rock (see also comments below).

The Paglamin Lake Stock is also unusual; two of the gold showings (properties 9 and 15, *see* Map 2469, back pocket) are associated with auriferous quartz

veins. These veins occur within shear zones which lie between the stock and its off-shoots into the enveloping rocks. On the northern shore of Paglamin Lake, a cataclastic contact separates a highly sheared variety of rocks. The rocks comprise granodiorite, gabbro-diorite (part of the mafic intrusion), quartz-chlorite schist, and quartz-carbonate veins. Highly sheared quartz-chlorite-sericite rocks occurring west and east of Adel Lake have also been interpreted as sheared equivalents of the Paglamin Stock with or without the blue quartz "eyes". West of Pyro Lake, a body of porphyritic and sheared rock (containing large opalescent quartz and feldspar) is about 30 m wide and extends westwards through Adel Lake, up to a point about 2.5 km southwest of Secon Lake. Although the area was mapped during the current field work as sheared sediment, it has currently been interpreted as an off-shoot of the Paglamin Lake Stock. It is distinctive because it is the only rock-type in which a fault breccia structure is developed. This rock separates relatively unaltered wackes immediately to the south from banded unsubdivided metasediments to the north, and hosts sulphide-facies ironstone in Property 11 (*see* Map 2469, back pocket). The fault breccia texture (Photo 13) is defined by broken rock fragments and crystals which are suspended in an aphanitic groundmass with abundant clinozoisite. In thin section, the rock is seen to be almost completely recrystallized and consists of large, strained, distorted, and foliated grains of quartz (30 to 40 percent), recrystallized feldspar (up to 20 percent), chlorite-sericite (20 to 30 percent), calcite (about 10 percent), clinozoisite (up to 20 percent), and possibly palagonite. A mortar structure, in which foliated chlorite-sericite grains wrap around recrystallized quartz grains is present. The brecciation may have reached the blastomylonite stage.

Chemical analyses of samples from the Paglamin Lake Stock are given in Table 6 and a ternary plot based on modal determinations is given in Figure 4.

Middle to Late Precambrian (Proterozoic)

MAFIC INTRUSIVE ROCKS

The diabase dikes post-date the granitic intrusions and cross-cut all other rocks in the map area. Some of the dikes are porphyritic and some others may contain adequate magnetic minerals to respond to ground magnetometer surveys, but not enough to give a magnetic expression on aeromagnetic maps 2160G, 2161G, 2171G, and 2172G (Ontario Department of Mines-Geological Survey of Canada 1963a, 1963b, 1963c, and 1963d).

The diabase dikes occur as sets that strike northeast and northwest and range in thickness from 10 to 15 m, but a narrow, fine-grained diabase dike, about 1 m wide was observed in an outcrop on the southern side of Highway 11, just west of the Northeast Road junction. The diabase dikes cannot be traced along strike for any great distance because they are invariably off-set or terminate against the numerous fractures, shears, and faults in the map area. Diabase dike textures are controlled by the dike width. Although all dikes in the area have fine-grained to aphanitic chilled margins, the narrower dikes (less

than 2 m wide) are generally fine grained, whereas the wider dikes (2 to 15 m wide) tend to be medium to coarse grained.

The diabase dikes are distinctive rocks which are fine-, medium- or coarse-grained, light- to dark-grey rocks with a salt-and-pepper texture. Examination of thin sections of diabase reveals typical diabasic texture in which relatively less altered laths of labradorite (40 to 50 percent), enclose altered titaniferous augite, pigeonite (10 to 45 percent), and hornblende (5 to 20 percent), and are enclosed in a groundmass of alteration products. Alteration products of pyroxenes and plagioclase include hornblende (up to 20 percent), biotite, and chlorite (1 to 20 percent), and sericite. Other minor minerals include magnetite, probable leucoxene, epidote, quartz, and other opaque minerals.

Cenozoic

QUATERNARY

Pleistocene and Recent

Outcrops in the map area are extremely sparce, and amount to only about 10 percent of the area, due to unconsolidated deposits of Pleistocene and Recent age.

Glacial and Recent deposits are indicated on the geological map (Map 2469, in back pocket) either as stippled areas, areas of extensive sand and gravel plains, or those areas where outcrop is not indicated which are areas of swamps, muskeg, and peat bogs.

PLEISTOCENE

Unconsolidated sand and gravel deposits are products of ice movement which in the map area is indicated by the direction of glacial striae to have been towards a southwesterly direction (S50°W to S60°W). The effect of glacial erosion is evident. Many rounded hills exist, and some rock outcrops are not only polished smooth, but also display prominent glacial striae. Two types of glacial deposits can be recognized in the map area. In the first category, probable outwash deposits consisting of extensive flat sand plains are located from Lukinto Lake [outside the map area, *see* also MacDonald 1938, p.37] through Switzer Lake, up to Castlebar Lake; in the southwestern and central part of the map area; and in the southeastern corner of the map area. The second category of glacial deposits is the most extensive type, and consists of unsorted sand and gravel, and is probably a moraine deposit. In this type of deposit, typical moraine topography consist of irregular rounded hills separated by kettle lakes, and sinuous glacial ridges (eskers) between 20 m and 30 m above the valley of Hoiles Creek. Although the shape of individual hills is irregular, there is

a general alignment of lakes and hills in the east-west direction, parallel to the structure of the underlying rocks (MacDonald 1938, p.37), indicating that perhaps the underlying structure influenced the Quaternary deposition.

RECENT

Recent deposits in the map area are generally restricted to low-lying terrain which is usually poorly drained with aquatic vegetation. In these areas cedar, spruce, and open swamps as well as muskeg are developed. In addition, peat deposits are also found in the map area.

STRUCTURAL GEOLOGY

Regional Setting

The Klob Lake area comprises an easternmost extension of the east-trending Beardmore-Geraldton Metavolcanic-Metasedimentary Belt as outlined by Pye *et al.* (1966). The belt lies in the Superior Structural Province. In the map area, the Wabigoon and Quetico Subprovinces are prominent structural and petrological subunits. The boundary between these belts has not formally been defined, but has been indicated by Ayres (1969) to be apparently stratigraphic; there is no evidence for a major structural break. In the map area, no defined field marker horizon indicates the boundary. An east-northeast zone about 1.6 km wide in the east and about 3.2 km wide in the western part of the map area, which includes part of the Gravel River-Kamuck River Fault (Carter 1975), separates the predominantly metavolcanic Wabigoon Subprovince to the north, from the predominantly metasedimentary Quetico Subprovince to the south.

Structural Geology

FAULTS

The most prominent structural features of the map area are faults, as indicated by the several features characteristic of faulting which include:

1. schistose, crushed and mylonitized wall-rocks
2. fault breccia development, observed only near the southern shore (eastern end) of Adel Lake
3. lithologic or structural off-sets
4. wall-rock alteration such as carbonatization, silicification, sericitization, and so on

5. physiographic high ridges separated by deep valleys or gullies along which the country rock is sheared, only developed on the Gravel River-Kamuck River Fault, the prominent fault in the southern part of the map area
6. photo lineaments
7. aeromagnetic lineaments

The Gravel River-Kamuck River Fault is described by Carter (1975) in the Dickison Lake area. This fault appears to extend about 180 km northeasterly into the map area where it is located in the metasediments near the southern border of the map area. The fault is prominently evident where steep-sided ridges located north of Pagwachuan Lake, partly along the East Road, are defined partly by the 60 500 gamma contour, by schistose, crushed, and mylonitized wall-rocks (metasediments), and by possible lateral displacement of about 300 m on a diabase dike located southeast of Decision Lake.

The fault outlined along Klob Lake and Hoiles Creek by Innes and Ayres (1971) as a photo lineament is located in the southern part of the northern metavolcanic unit. This fault extends from beyond the eastern border of the map area, through Pyro Lake and Adel Lake, westwards along Hoiles Creek through Hope, Charity, and Faith Lakes to beyond Klob Lake. In almost every case, the country rock adjacent to the fault has been sheared, carbonatized, silicified, and/or brecciated. Because of the lack of marker units on either side of this fault, it is difficult to speculate on the manner and direction of movement. Fault breccia is best developed west of Pyro Lake, and the fault probably extends eastwards beyond the limits of the map area.

Other shear zones have been recognized by the author, and his assistants, and by exploration companies, in most of the old gold prospects. Some of the shears have been traced on the surface for between 90 m to 150 m as reported by MacDonald (1938, p.39), who also recognized that the shear zones consist of auriferous carbonatized quartz veins. The shear zones which are too small to show on the map strike nearly due east and generally dip steeply to the north. In almost all cases, the enclosing country rocks are highly sheared and have been converted into biotite-chlorite-sericite-carbonate schists.

FOLDS

Structural and/or stratigraphic information that would indicate the style of folding is lacking. In general, the metavolcanics and metasediments dip steeply to the south, but local south facings determined from pillow lava and graded- and crossbeds have been indicated on Map 2469 (see back pocket). Major regional folds have not been outlined, but several minor S- and Z-shaped minor folds are widespread in the metasediments, especially within the iron formation units where similar repeated folds are exhibited on a scale too small to show on the geological map. Small isoclinal folds, as well as kink folds and drag folds were observed, but provided only scant data that was inadequate for the interpretation of the existence of any major folds.

BEDDING, FOLIATION, LINEATION

The bedding in clastic metasediments is marked by well-defined planes which separate laminae or beds of wacke, mudstone, or conglomerate. The wacke beds are generally graded and less commonly crossbedded, and, since the wacke and mudstone grade into one another and are intricately interbedded, the bedding is generally prominent in the less altered clastic metasediments in the map area.

Foliation is the general broad term used to refer to the parallel set of fabrics in metamorphic rocks that result from tectonic or metamorphic deformation, or from flowage during crystallization (American Geological Institute Glossary 1968, p.191; 1972, p.272). All the supracrustal rocks of the map area and some parts of the stocks that intrude these rocks display a well-developed, steeply dipping (shallow at Proctor Lake) metamorphic and tectonic foliation which is defined by the subparallel orientation of micaceous minerals and by the elongation of pyroclastic fragments and pillows. Only the highly metamorphosed rocks resulting from tectonic and cataclastic deformation are schistose, hence, fewer schistosity symbols occur on the geologic map (*see* Map 2469, back pocket). In the map area, some of the pyroclastic mafic metavolcanics and some of the unsubdivided metasediments display thin and nearly parallel bands of different textures, colours, or minerals. In these rocks, dark laminae are conspicuous because of well-developed amphibole and garnet metacrysts, and they differ in colour from the adjacent quartzofeldspathic (light) layers. This type of banding is restricted to an area about 1.3 km wide, and extends from Pyro Lake to Gabbro Lake, and also along strike south of Decision Lake. The banding is nearly always parallel to the bedding in the metasediments, but is cut obliquely at about 10 to 30 degrees by the foliation.

Lineation [Structural Geology] is used as defined in the Glossary of Geology (1980, p.361) as "...any linear structure in a rock e.g. flow lines, slickensides, linear arrangements of components in sediments, or axes of folds. Lineation in metamorphic rocks includes mineral streaking and stretching in the direction of transport, crinkles and minute folds parallel to fold axes, and lines of intersection between bedding and cleavage, or of variously oriented cleavages."

Within the map area, the most common lineation occurs in the bedding or foliation planes and is produced by the preferred orientation of mafic mineral aggregates. Lineation also locally occurs at the intersection between bedding and foliation planes, and in the fragmental rocks is produced by stretched fragments (rodding). Flowage lineation produced by primary flowage in igneous rocks is masked by metamorphism in almost all phases of the three stocks, but may be locally observed in exposures of the Wee David Lake Stock along Highway 11, west of the pipeline cross-over.

Schistosity and Gneissosity

Schistosity is considered to be synonymous with foliation by many writers (American Geological Institute 1980, p.560) in that both are the result of the

parallel arrangement of platy and ellipsoidal minerals.

In the map area, schistosity occurs in very fine grained schistose rocks and in some of the coarser grained metamorphic rocks, whereas foliation is almost ubiquitous in all rocks.

Gneissosity, which is a composite structure, consists of alternating granular bands and lenses which differ in mineral composition and texture (American Geological Institute 1972). Gneissosity was either too distorted to measure or was rarely observed, in the following areas:

1. On the shores of and to the south of Pagwachuan Lake where alternating light-and-dark (recrystallized mudstone) rocks are interbedded with white to light grey (recrystallized wacke) units.
2. On the border between the granitic stocks and the metavolcanics where assimilation of the country rocks may result in leucocratic granular layers and mesocratic layers which differ in composition and texture.

Joints

Jointing is a common feature in all of the rocks of the map area. No attempt was made to study these features in detail, but numerous attitudes were recorded and are plotted on Map 2469 (back pocket).

A cursory glance of the attitudes recorded on the map indicates that there are several joint directions, and that the predominant joint directions seem to be: northeast and northwest parallel to most of the diabase dikes; and east-west parallel to the rock contacts and faults. Cross-cutting relationships recorded in the field indicate several periods of jointing. Some joint sets are filled with aplite, quartz, epidote, pegmatite, or other granitic material.

In an outcrop in the southwestern part of the map area about 7 km south of Highway 11, several isolated epidotized fragments are crossed by very close-spaced and parallel joints, whereas the outcrop is otherwise unjointed (Photo 14).

CORRELATION BETWEEN GEOLOGY AND AEROMAGNETIC DATA

The map area has been extensively investigated by airborne and ground magnetic surveys by several mining companies beginning in the early 1950s; Can-Fer Mines Limited conducted an extensive aeromagnetic survey of a larger area that included the current map area (Assessment Files Research Office, Ontario Geological Survey, Toronto). The map area was also covered during airborne magnetometer surveys flown in 1960 and 1962 for the then Ontario Department of Mines and the Geological Survey of Canada. The resulting aeromagnetic maps 2160G, 2161G, 2171G, and 2172G, at a scale 1 inch to 1 mile (1:63 360) and aeromagnetic map 7102G, scale 1 inch to 4 miles (1:253 440) were released in 1963 and 1965 (Ontario Department of Mines-Geological Survey of Canada 1963a, 1963b, 1963c, and 1963d; 1965). The aeromagnetic

OGS 10 821

Photo 14–Peculiar texture of close-spaced parallel joints in epidotized fragments (possibly remnants of pillow cores, compare with Photo 1) in metavolcanic flows located 3.2 km southwest of the western end of Klob Lake.

maps are useful in extrapolating geology, especially the ironstone-bearing units that are intercalated mainly with the metasediments, and that are continuous over several kilometres of strike-length. The rocks of 2 of the granitic stocks also exhibit magnetic properties that distinguish them from the metavolcanic country rocks, such that these stocks can also be outlined by a defined magnetic expression.

Correlation With Ironstones

A prominent feature of aeromagnetic map 2160G (Pagwachuan Lake Sheet) and the Can-Fer Mines Limited aeromagnetic survey (File 63.2901, Assessment Files Research Office, Ontario Geological Survey, Toronto) is the outline of the ironstone-bearing zone investigated by the Can-Fer Mines Limited from 1953 to 1958. In the map area, the ironstone-bearing zone is composed of 2 bands:

1. A northern band which extends from the southwestern part of the map area in the vicinity of Hoiles Creek. The band extends eastwards to a point 2.6 km northwest of Snoopy Lake. In this band, which is in-

termittently exposed in the field, a magnetic high of 62 700 gammas is indicated in an area about 3.9 km north-northeast of Hoiles Lake. The magnetic high area is exposed and consists of narrow magnetite ironstone beds that are extensively intercalated with the coarse-grained sandstone, conglomerate, and mudstone units;

2. A southern band which extends from an area about 0.7 to 1.3 km east of the northern end of Laponen Lake (southwest of the map area), through Hoiles Lake, up to a point about 1 km north-northeast of Decision Lake, or 1 km west of Gabbro Lake. Two magnetic high peaks of 62 400 and 61 200 gammas occur east of Hoiles Lake and northwest of Decision Lake respectively. Except for a few ironstone-bearing outcrops at the eastern extremity of the band, this iron formation is unexposed.

Elsewhere in the map area, the magnetic intensities due to ironstone are considerably less than those of the bands just described. In most cases, it has been proven by diamond drilling and trenching that the rest of the magnetic highs are due to a number of disseminated (up to 30 percent) to massive (up to 80 percent) zones of pyrite and pyrrhotite with trace base-metal sulphides (Assessment Files Research Office, Ontario Geological Survey, Toronto). These magnetic highs are located 2.6 km south of Garfinkle Hole, and just south of Highway 11 (60 860 gammas); 1.3 km north of the western end of Klob Lake (60 740 gammas); 1.3 km south of Switzer Lake (60 520 gammas); around Faith and Offsider Lakes (60 720 gammas); 2.6 km south of the northeastern end of Todd Lake (60 520 gammas); 1.3 km southeast of Secon Lake (60 580 gammas); and between the eastern end of Adel Lake and Pyro Lake and eastward beyond the limits of the map area (60 520 gammas). The last magnetic high area has been exposed by trenching (Property 11, *see* Map 2469 in back pocket) and consists of disseminated to massive seams of pyrrhotite, pyrite, and magnetite, and wider seams of magnetite, pyrrhotite, and pyrite in local granitic and talc-sericitic schist zones.

Correlation With Lithologic Boundaries

The contact between the Wee David Lake Stock and the mafic metavolcanic flows is interpreted to lie along the 60 400 gamma contour, separating the well-spaced contour lines below 60 400 gammas within the stock from the more closely-spaced contour lines of higher intensity above the 60 400 gammas within the metavolcanics.

The boundary of the Paglamin Lake Stock is vaguely defined by the 60 500 gamma contour in the area of Adel Lake, Pyro Lake, the eastern end of Klotz Lake, and Pit Lake.

During the current field work, the diabase dikes were observed to contain magnetic minerals, but these dikes are not outlined by the aeromagnetic data. In the ground magnetic survey performed by Mattagami Lake Mines Limited in 1977, several close-spaced magnetic "highs" and "lows" with up to 5000 gamma relief which are probably suggestive of the diabase dikes which strike northwesterly and cross Highway 11 and the Northeast Road at the western part of Property 8, were reported by Sutherland (1977).

The edges of gabbroic bodies are known to exhibit shear zones which contain auriferous quartz-carbonate veins containing pyrite and pyrrhotite, but these bodies are not outlined by the aeromagnetic data. The ground magnetic survey of the Bellex Mines Limited indicated 2 contacts at 900 and 2000 gammas (Bradshaw 1970). The higher intensity contour was interpreted to represent the contact of the gabbro/diorite body located in the southwestern part of the map area.

ECONOMIC GEOLOGY

The exploration activity of the 1930s in the map area was started by the discovery of gold and the development of the Hardrock Gold Mine, Little Longlac Gold Mine, and the MacLeod-Cockshutt Mine in 1931-1932 at Geraldton (Horwood and Pye 1955). This made Geraldton the business community centre of the Little Longlac area (Bruce 1935, 1937). Nearly all of the recorded past exploration activity was confined to only a few gold prospects in metasediments near the northern metavolcanics, during the 1930s to 1950s. No significant gold deposits have been outlined to date.

In the map area, there are no past or present producing gold mines, but Theresa Gold Mine, located about 20 km west-southwest of the map area was operated between 1945 to 1955, during which time approximately 4300 ounces of gold and 202 ounces of silver were produced (Ferguson *et al.* 1971). A list of host rocks and widths of sulphide intersections are given in Table 7.

A list of properties is given in Table 8, and selected assays are given in Table 9.

Development of geophysical exploration methods has led to recent surveys being directed towards the search for economic massive sulphide deposits containing valuable metals in the area. Several conductor zones have been outlined by recent exploration surveys, but all of these conductive zones outlined and tested to date have been reported to be due to graphitic zones with disseminated to massive pyrite, pyrrhotite with or without only minor magnetite, chalcopyrite, arsenopyrite, and sphalerite. Interbanded magnetite ironstone and chert zones with trace to low values of base metals have also been intersected. In the current survey, only grab samples from the property of Milestone Exploration Limited returned significant gold assay values of up to 2.2 ounces of gold per ton. Samples from the other examined properties indicated trace to low values of gold (Assays by Geoscience Laboratories, Ontario Geological Survey, Toronto).

TABLE 7 | HOST ROCKS AND WIDTHS OF SULPHIDE INTERSECTIONS, KLOB LAKE AREA.

Property	Hole Number	Sulphide Intersection	Host Rocks
Canadian Nickel Company (1971) (2)	42993	Stringers of py-po 1-20%	Mafic metavolcanics.
	42993	0.4 ft, py-po at 80%	Mafic metavolcanics.
M. Lyons (7)	G2	8 ft, 75% po, 10% py	Silicified tuff and banded andesite.
	G2	1 ft, py-po	Graphitic schist.
	G4	1 ft, 75% po	Massive and banded andesite.
Mattagami Lake Mines Limited (8)	G1	3 ft, 30% po, 15% py	Massive and banded andesite.
	G1	25 ft, 40% po, 20% py	Massive and banded andesite.
	G1	2 ft, 25% po-py, 25% G	Graphitic schist.
	G1	25 ft, 75% G, 25% py-po	Graphitic schist.
	J	5 ft, 60% po, 5% py tr. cpy	Silicified andesite.
	I	5 ft, G and py-po	Silicified andesite and graphitic schist.
	B	5 ft, 20-60% po, 10% py	Silicified andesite.
Hudson Bay Exploration and Development Company Limited Occurrences (6)	J1	2.5 ft, 20-25% py-po	Tuffaceous andesite.
	J1	8 ft, 10-15% py-po	Tuffaceous andesite.
	J1	2 ft, 20-30% py-po	Tuffaceous andesite.
	J2	5 ft, 20-30% py-po	Amygdaloidal and massive andesite.
	J2	3.5 ft, 15-20% py-po	Andesite.
	J2	10 ft, 5-10% py-po	Andesite.

Note:
All host rocks are given as described in the drill logs, they are probably all intermediate to mafic flows of Map Unit 1 of this study.

Abbreviations
G Graphite
py Pyrite
po Pyrrhotite

TABLE 8 | LIST OF PROPERTIES, MINERAL OCCURRENCES, AND AREAS OF EXPLORATION, KLOB LAKE AREA.

Number on the Geological Map	Name
1.	Bellex Mines Ltd. (1970).
2.	Canadian Nickel Company (1971).
3.	Can-Fer Mines Ltd. (1958).
4.	Carre, Joseph.
5.	Durst, Bonnar H.
6.	Hudson Bay Exploration & Development Co. Ltd., Occurrences.
7.	Lyons, Edward M.
8.	Mattagami Lake Mines Ltd.
9.	Milestone Exploration Ltd.
10.	Morrow, Leonard (1976).
11.	Onesime, Albert.
12.	Otto, Harold H., and Lawrence J.
13.	Placer Development Ltd.
14.	Potter, George.
15.	Shell Canada Resources Ltd.
16.	Temagami Oil and Gas Co. Ltd.

Mineral Occurrences

A number of selected grab samples of mineralized rocks (30 in all) (*see* Map 2469, in back pocket for locations) were submitted by the author for assays that were conducted by the Geoscience Laboratories, Ontario Geological Survey, Toronto. Information on economic mineral occurrences of the area which have been sampled and investigated is summarized for the most part under the individual properties.

The primary economic interest in the map area and in the adjoining Geraldton-Longlac area has been gold since the early 1930s. The magnetite ironstone-bearing formations found in the map-area are much too low in grade to be of economic potential because of the high proportion of interbedded clastic metasediments. Sand and gravel deposits are widespread in the map area and have been utilized for the construction of logging roads. Other occurrences of non-auriferous metallic minerals such as pyrrhotite-pyrite ironstone containing trace amounts of base metals are also described under the individual properties.

TABLE 9 | ASSAYS OF SELECTED SAMPLES FROM THE KLOB LAKE AREA.

Sample No.	Location, Latitude and Longitude	Rock Name (Field)	Laboratory No.	Ag	Au	Cu	Ni	Pb	Zn
9A-678	49°46'23" / 85°58'31"	Granodiorite	4880	< 3	80	18	25	17	16
9A-558	49°50'36" / 86°01'48"	Porphyry Flow	4881	< 3	5	450	20	11	142
9A-606-2	49°43'26" / 85°58'27"	Pegmatite	4882	< 3	25	6	5	23	8
9A-503-5	49°47'07" / 86°11'56"	Feldspar Porphyry	4883	< 3	< 3	54	12	19	24
9A-142-1	49°45'21" / 86°09'24"	Pillowed Flow	4884	< 3	< 3	22	60	14	70
9A-058-2	49°47'07" / 86°10'00"	Quartz Diorite	4885	< 3	< 3	66	17	12	94
9A-644-1	49°44'42" / 86°11'30"	Metased?	4886	< 3	9	41	34	> 10	76
9A-106-1	49°38'20" / 86°20'10"	Ironstone	4887	< 3	9	51	43	> 10	29
9A-055-2	49°47'30" / 86°01'00"	Pillowed Flow	4888	< 3	80	162	69	> 10	90
9A-001-3	49°44'49" / 86°14'05"	Tuff	4889	< 3	44	172	25	> 10	97
9A-068	49°48'27" / 86°10'51"	Granodiorite	4890	< 3	< 3	14	9	11	44
9A-502	49°47'03" / 86°13'54"	Mafic Pillowed Flow	4891	< 3	4	580	132	> 10	600
9A-055-2	49°47'30" / 86°01'00"	Pillowed Flow	4892	< 3	6	360	52	> 10	130
9A-581	49°47'55" / 86°10'29"	Granodiorite	4893	< 3	3	25	9	12	26
9A-067-2	49°48'13" / 86°11'00"	Tuff	4894	< 3	3	280	38	> 10	114
9A-644-2	49°44'42" / 86°11'30"	Ironstone	4895	< 3	< 3	52	77	17	94
9A-084-1	49°44'47" / 85°56'35"	Wacke	4896	< 3	< 3	54	76	18	89
9A-054-3	49°47'25" / 86°01'00"	Pillowed Flow	4897	< 3	12	132	79	> 10	98
9A-076-1	49°47'11" / 86°12'36"	Pillowed Rock	4898	< 3	5	82	18	> 10	210
9A-600	49°44'36" / 85°58'41"	Metased?	4899	< 3	5	74	10	22	170
9A-683-2	49°44'36" / 86°08'45"	Ironstone	4900	< 3	< 3	6	57	< 10	51
9A-160-2	49°46'15" / 86°00'07"	Ironstone	4901	< 3	890	96	55	< 10	53
9A-679-1	49°46'24" / 85°58'06"	Biotite Gneiss	4902	< 3	23.5*	910	30	< 10	9
9A-677	49°46'39" / 86°01'45"	Quartz Porphyry	4903	< 3	40	8	8	< 10	28
9A-662	49°43'36" / 86°12'54"	Ironstone	4904	< 3	16	400	31	< 10	54
9A-678 (2)	49°46'23" / 85°58'31"	Granodiorite	4905	< 3	100	13	28	23	30
9A-679-3	49°46'24" / 85°58'06"	Quartz vein	4906	< 3	74.3*	1250	49	22	< 5
9A-678 (1)	49°46'23" / 85°58'31"	Granodiorite	4907	< 3	370	194	26	17	33
9A-683-1	49°44'36" / 86°08'45"	Wacke	4908	< 3	10	8	90	< 10	50
9A-678 (3)	49°46'23" / 85°58'31"	Granodiorite	4909	< 3	80	8	29	22	26

Notes:
1. Assays by Geoscience Laboratories, Ontario Geological Survey, Toronto.
2. Assays are given in ppm except for Au which is given in ppb, except where indicated.
3. Samples 9A-142-1, 9A-106-1, 9A-054-3, 9A-683-2, and 9A-160-2 are not plotted on Map 2469, back pocket.
4. *Assay given in ppm.

GOLD

Examination of assessment work files indicates that most of the old gold workings were within sheared zones containing auriferous quartz-carbonate veins in metasediments near the northern metavolcanics. In addition to gold, these old gold workings are reported to have contained pyrite, pyrrhotite, and arsenopyrite, with chalcopyrite (MacDonald 1938). Other deposits have been located in irregular veins of quartz accompanied by pyrite, filling fractures in iron formation; and in zones of pyritization and silicification in both sediments and intrusive rocks (Bruce 1935). In the Geraldton-Longlac gold areas, most of the development and production work was done on deposits in the thick beds of greywacke or arkosic metasediments that lie between 2 ironstone-bearing formations and are located within a few kilometres of gabbroic stocks (Bruce 1935, p.29).

In the map area, most of the known occurrences are also located in the metasediments, but are mainly located along sheared contacts within several tens of metres of gabbroic/dioritic intrusive bodies and within several hundred metres south of the southern contact of metasediments with the northern mafic metavolcanic unit. Though small gabbroic/dioritic intrusions are common in the map area, 3 large bodies of gabbro/diorite are of particular interest in regard to gold occurrence and exploration. In all 3 of these bodies, old gold occurrences are located in shear zones near the contacts between these bodies and the metasediments: 1) south of Paglamin Lake (Caramat Gold Mines occurrence, currently owned by Milestone Exploration Limited); 2) west of Snoopy Lake (Kenogamisis Gold Mines occurrence, currently owned by Shell Canada Resources Limited), and 3) in the southwestern corner of the map area (Ward-Morrow occurrence, currently owned by Bonnar H. Durst).

In the Beardmore area, a considerable number of gold producers and prospects occur in the southernmost mafic metavolcanics, and are shown on the Tashota-Geraldton compilation map (Pye *et al.* 1966). In the map area, a mafic volcanic unit that is interpreted to be the eastern extension of the Beardmore unit is poorly exposed, and therefore has not been extensively explored.

The source of gold mineralization in the map area may be related to the following features:

1. In the map area, as well as in the Beardmore-Geraldton area, the gold occurrences are associated within 100 to 200 m of the southern contact of the norther. metavolcanics with the metasediments.
2. In the map area, as well as in the Geraldton area, the most important gold production is located in shear zones within several tens of metres of gabbroic/dioritic intrusive bodies.
3. The shear zones host auriferous quartz-carbonate veins which in addition to gold are reported to contain pyrite, pyrrhotite, and arsenopyrite with chalcopyrite.
4. Sulphide- and oxide-facies iron formations are invariably found within a few metres of the occurrences.

The mineralizing solutions were probably derived from some source during volcanic or hydrothermal activity, and were introduced along the sheared metavolcanic-metasedimentary contact and along subsidiary parallel shears. The solutions were probably localized by the gabbroic/dioritic intrusions that may

have acted as impermeable confining blocks. The quartz-carbonate veins probably indicate that the mineralizing solutions were siliceous and probably alkaline. The solutions were capable of reacting with the enclosing country rocks. This is suggested by the occurrence of quartz + chlorite + carbonate + sericite schists. These schists have been exposed by trenches used to find auriferous quartz-carbonate veins at most of the old gold prospects.

IRON

Ironstone in the map area probably represents the easternmost extension of the iron deposits located east of Lake Nipigon. These deposits were reported by Coleman (1909, p.128) as follows:

> The iron ranges east of Lake Nipigon contain a considerable amount of lean ore with comparatively small amounts of injurious impurities but generally in narrow lenses separated by several feet of jasper and schist.

Coleman (1909, p.127) also reported that assays of the best samples returned metallic iron content values of 38.06 percent, but that averaged about 30.06 percent total iron across a width of 25.3 m.

In the map area, selected ironstone-bearing grab samples collected by the field party returned values of 18 to 30 percent total iron (Geoscience Laboratories, Ontario Geological Survey, Toronto). These samples were taken from interbedded magnetite ironstone and chert layers which are intercalated with the metasediments. These interbedded layers are not commonly more than 5 cm wide (*see* Photo 10) and occur in zones which are 10 to 15 m wide occurring along continuous strike lengths of several kilometres (*see* section on "Ironstone"). In the map area, 2 linear magnetic zones indicate the sub-surface extent of ironstone-bearing units.

The iron deposits were investigated by Can-Fer Mines Limited in 1958. The bulk of the claims staked then by the company were located outside the map area to the southwest (Assessment Files Research Office, Ontario Geological Survey, Toronto).

Can-Fer Mines Limited eventually allowed all the ground that it had staked in the map area to lapse, but retained a few blocks of patented claims located outside the map area, in the vicinity of the McKay-Laponen Lakes.

SULPHIDE MINERALIZATION

In the assessment files, a number of disseminated (up to 30 percent) to massive (up to 80 percent) zones of pyrrhotite and minor pyrite with trace sphalerite and/or chalcopyrite are reported in drilling on the following properties [*see* Map 2469, for location of properties]: Canadian Nickel Company Limited (Property 2); Edward Lyons (6); Mattagami Lake Mines Limited (7); Temagami Oil and Gas Company Limited (15); and The Hudson Bay Exploration and Development Company Limited (16). In this drilling, disseminated to massive sul-

phide zones reported to be 1 to 25 feet thick have been alleged to contain trace amounts of chalcopyrite and/or sphalerite. In the accompanying drill log description of these properties, the following can be inferred: the sulphide zones are almost exclusively contained in mafic to intermediate flows and associated tuffs; the minor disseminated sulphides were related to felsic porphyritic intrusive rocks; the disseminated to semi-massive mineralization was accompanied by silicification; and the sulphide minerals were sometimes hosted by graphitic zones. These intersections were not exposed in any of the outcrops in the map area and have not been examined by the author.

Silicification and development of graphitic zones suggest that these zones may represent local iron-rich pulses which occurred during exhalative volcanism (Ridler 1973). This type of environment is typical of most Archean greenstone belts and may be used as a stratigraphic marker horizon (Ridler 1973; Hutchinson *et al.* 1972). In the map area, there are no rock outcrops in the areas where diamond drills have been put down. These drilled areas are isolated, from each other, therefore it is difficult to tell whether the massive to disseminated sulphide zones can be traced along strike.

DESCRIPTION OF PROPERTIES

As of September 30, 1979, following the completion of the field mapping, 11 properties were owned by companies or individuals. Of these only 1 property, consisting of a group of 16 contiguous surveyed and patented mining claims, was on lease to Milestone Exploration Limited (9). Information on numerous parcels of land upon which significant exploration work had been conducted, but on which no mineral deposits had been discovered, however, is available for some of the companies or individuals (Regional Geologist's Files, Ontario Ministry of Natural Resources, Thunder Bay; and the Assessment Files Research Office, Ontario Geological Survey, Toronto). The work done is described alphabetically; properties are titled according to ownership as of December 31, 1979, areas of exploration are titled under the heading of the company or individual who performed exploration work, and the date in square brackets after the name is the date of the last recorded major work done on defunct properties.

The number in parentheses following each property refers to location numbers on the geologic map in the back pocket.

Bellex Mines Limited [1970] (1)

In 1970 Bellex Mines Limited held a property consisting of 27 unpatented contiguous mining claims numbered TB 216561 to TB 216562, TB 216570 to TB 216572, TB 218087 to TB 218092, and TB 278542 to TB 278556, all inclusive, and located about 5 km northwest of Pagwachuan Lake. The property included 6 claims encompassing the A. Ward-W. Morrow prospect (MacDonald 1938, p.39) which is currently owned by Bonnar H. Durst (5).

EXPLORATION SURVEYS

Electromagnetic and magnetic surveys were completed on the property between August 25 and September 10, 1970 (Bradshaw 1970). Bradshaw's account of the results and interpretation of the surveys is summarized as follows:

MAGNETIC SURVEY

An east-northeast trend of isomagnetic contours having a relatively broad magnetic background ranging from 500 to 1000 gammas was outlined by the survey. Along the northern boundary of the property, a prominent magnetic linear high averaging about 30 m wide and striking east-northeast was delineated. This feature was interpreted to represent a lean ironstone-bearing zone; an interpretation upheld by the current field mapping.

South of the ironstone close to the baseline, the magnetic susceptibility decreased fairly uniformly. Along the baseline, a linear magnetic low 1.6 km long is enclosed by the 400 gamma contour. South of this magnetic low, a steep magnetic gradient to an area of higher magnetic susceptibility was reported. Bradshaw concluded that the magnetic survey indicated 2 contacts at the 900 and 2000 gamma contours, believed to be the contacts between metasediments (low), metavolcanics (medium), and metadiorite (up to 8500 gammas). This interpretation was upheld during the field mapping.

ELECTROMAGNETIC SURVEY

A number of conductive zones were located by the survey. In general, the auriferous quartz-carbonate veins in shear zones containing iron sulphide minerals within the Ward-Morrow prospect were outlined by electromagnetic conductors A and B, (*see* Bradshaw 1970). These were recommended for further prospecting. Conductor A, striking east-northeast is over 1.6 km long and was interpreted as being of weak to moderate conductivity, probably representing graphitic metasediments. Conductor B, located near the centre of the property, 155 m south of the baseline, is about 950 m in length along an east-northeast strike. No record of subsequent additional surveys is available.

During the field mapping, the author and his assistants were unable to locate the old workings of the Ward-Morrow prospect. These old exploration trenches were also not located by the personnel of Bellex Mines Limited because of the scarcity of outcrop in this general area. The old prospect was visited by MacDonald in 1937 (MacDonald 1933, p.39), and his description of the showings is summarized in the section on "Bonnar M. Durst" (5).

Canadian Nickel Company [1971] (2)

It is not known how much ground was staked by the Canadian Nickel Company within the map area in the early 1970s. Assessment work files (Resident Geologist's Files, Ontario Ministry of Natural Resources, Thunder Bay) indicate that between 1970 and 1971, the Canadian Nickel Company owned 2 isolated blocks of unpatented claims, 1 in the Lydia Lake area, and the other in the Castlebar Lake area. The Castlebar Lake claim block was composed of at least 4 contiguous claims numbered TB 290938 to TB 290941 inclusive, and the Lydia Lake group consisted of at least 21 contiguous mining claims some of which were numbered TB 251133, TB 251447 to TB 251452 inclusive, TB 251590 to TB 251593 inclusive, and TB 251602 to TB251608 inclusive. The ground covered by the groups of claims is currently open for staking.

In April 1970 and January 1971, 4 diamond-drill holes totalling 688.5 m in length were collared in the Lydia Lake area on claims TB 251133 (drillhole Number 49247, 675 feet deep[1]), TB 251605 (drillhole Number 49248, 647 feet deep), TB 251591 (drillhole Number 41094, 400 feet deep) and TB 251448 (drillhole Number 41095, 378 feet deep). The drillholes were reportedly collared in mafic metavolcanic country rock and intersected disseminated stringers of pyrite and pyrrhotite (1 to 10 percent) with trace chalcopyrite (Assessment Files Research Office, Ontario Geological Survey, Toronto). During March 1971, 1 diamond-drill hole numbered 42993, 389 feet deep, was collared on claim TB 290941 in the Castlebar Lake group. The drillhole was reportedly collared in mafic metavolcanics cut by quartz-feldspar porphyry dikes. Disseminated stringers of pyrite and pyrrhotite (1 to 20 percent) with trace amounts of sphalerite were observed. A narrow (0.33 m) wide section containing 80 percent pyrite was intersected between lengths of 218.3 and 218.7 feet. The collar locations were not found by the field party, but have been located on Map 2469 (back pocket) from available company sketches (Assessment Files Research Office, Ontario Geological Survey, Toronto).

In the terrain around both claim groups, which are currently open for staking, outcrop is not common. In the area about 1.6 km east of Lydia Lake on Highway 11, several gossan zones within pillowed mafic flows containing pyrite, pyrrhotite, and trace chalcopyrite were examined by the current field party. Outcrops to the east of Todd lake about 1.5 km east of the Castlebar Lake block, are composed of pillowed mafic flows as well as narrow associated interflow tuffs.

The Canadian Nickel Company property of 1970 was probably acquired to procure selected airborne conductors; no outcrop is known to exist in the properties, and no other surficial geological feature seems to have influenced the selection of these areas for a follow-up survey by diamond drilling.

[1]The reader should consult the Conversion Table at the front of the report to metricate. As far as is known, the original measurements only are given in this report.

Can-Fer Mines Limited [1958] (3)

Can-Fer Mines Limited conducted an airborne magnetic survey over a large area that included parts of the southern half of the map area. The airborne magnetic survey outlined in further detail the magnetic zones attributable to ironstone-bearing rocks indicated on Map 2160G, Pagwachuan Lake sheet (Ontario Department of Mines-Geological Survey of Canada 1963a). A number of these ironstone-bearing zones are indicated on the legend and face of Map 2469 (back pocket), but the 2 major ironstone areas that this company staked following the airborne survey are located between the area north of Outlet Bay on McKay Lake and the area south and east of Pagwachuan Lake, and in the area east of the northern end of Laponen Lake. These areas are located outside the southwestern corner of the map area where the bulk of patented claims staked by this company are still in good standing. Within the map area, the eastern extension of the second ironstone-bearing area is indicated by the Ontario Department of Mines and the Geological Survey of Canada aeromagnetic data and the airborne magnetic survey carried out by or for Can-Fer Mines Limited to consist of 2 bands of iron formation. These bands are:

1. A southern band, which extends from north of Decision Lake westward to the Snoopy Lake-Hoiles Lake area. This band has 3 peaks located a) north of Decision Lake, b) north of Snoopy Lake, and c) at Hoiles Lake.
2. A northern unit extending from north of Hoiles Lake westward to the southwestern part of the map area astride Hoiles Creek. Within the map area, this band has 2 peaks that were located north of Hoiles Lake, and over Hoiles Creek, in the southwestern part of the map area.

During the current field mapping, several outcrops of narrow ironstone-bearing units about 2 cm thick within the metasediments were mapped, and these broadly coincide with the outline of the airborne magnetic survey. The outcrops consisted of lean oxide-facies iron formation made up of chert and magnetite ironstone seams intercalated with sandstone.

The company does not currently own any claims within the map area. There is no record of diamond drilling by the company.

Joseph Carre (4)

Joseph Carre is the registered owner of 18 contiguous unpatented claims numbered TB 455598 to TB 455609, and TB 492140 to TB 492145, inclusive.

This ground, together with that of Edward M. Lyons (7) and George Potter (14) was on option to Pacific Cyprus Minerals Limited in 1977, and in 1978 to Dora Explorations Ltd (Assessment Files Research Office, Ontario Geological Survey, Toronto). On May 10, 1977, Pacific Cyprus Minerals Limited contracted Questor Surveys Limited to conduct an airborne electromagnetic and magnetic survey over these properties, which in total consisted of 66 claims at the time of the option (Assessment Files Research Files Office, Ontario Geological Survey, Toronto).

GEOPHYSICAL SURVEYS

A total of 70 line miles were flown over the property at an altitude of 400 feet and a line spacing of 660 feet using the "Barringer/Questor Mark VI Input E.M. System". According to Pollock (1977), the Input Survey outlined many zones of conductivity as well as responses produced by hydroelectric power lines and the natural gas pipeline.

Although numerous zones were recommended for additional ground follow-up to the airborne electromagnetic and magnetic survey, there is no record of subsequent exploration work, including that of diamond drilling.

GENERAL GEOLOGY

No exposures exist on the property, consequently the author cannot assess the 4 conductive zones outlined by the geophysical survey.

It is apparent from regional interpretation of outcrops in the vicinity of the property that it lies on the northern mafic metavolcanic unit.

Bonnar H. Durst (5)

Bonnar H. Durst is the registered owner of 6 contiguous unpatented mining claims numbered TB 452122 to TB 452127 inclusive, located in the southwestern part of the map area.

HISTORY

In 1937, this ground was covered by claims held by A. Ward and W. Morrow. According to MacDonald (1938, p.39), the Ward-Morrow claim group then consisted of 8 contiguous unsurveyed and unpatented mining claims numbered TB 20090 to TB 20095 and TB 20304 to TB 20305 both inclusive and are situated about 4.8 km north of the western end of Pagwachuan Lake. According to MacDonald (1938, p.9), the main showing which was extensively exposed by trenching, was on claim TB 20092. The showing is located in a fracture zone filled with auriferous quartz-carbonate vein material containing disseminated pyrite, chalcopyrite, and biotite, and that the pyrite and chalcopyrite also occurred in the wall rock.

In 1970, Bellex Mines Limited (1) owned a large property in this area that included all of the Ward-Morrow occurrence (Bradshaw 1970). Ground electromagnetic and magnetic surveys completed on the property between August 25 and September 10, 1970 indicated that the quartz-carbonate veins containing gold and chalcopyrite are related to 2 electromagnetic conductive zones (Bradshaw 1970; *see* section on "Bellex Mines Limited (1)"). There is no record of any diamond drilling or other subsequent work by Bellex Mines Limited.

It is not known to the author when Bonnar H. Durst staked the 6 claims. No record of exploration work has been submitted for Assessment Work Credit.

GENERAL GEOLOGY

Bedrock exposure on the property is limited. The only outcrops observed in the area are of a gabbroic-dioritic body displaying flow layering. This outcrop indicates a progressive cataclastic alteration westwards such that the rock becomes more sheared, loses the gabbroic texture, and is finally reduced into a chlorite schist. The immediate country rocks were not located by the field party, but in his examination of this property, MacDonald (1938, p.39), reported the wall rock to be a biotite-chlorite-carbonate schist (probably a sheared metasediment). Thin section examination revealed the rock to be a fine-grained chlorite schist containing appreciable amounts of carbonate and biotite, with magnetite and pyrite as minor accessories.

In the regional interpretation of outcrops within the property, the layered gabbroic/dioritic body is totally intrusive into the metasediments within 1.3 km of the southern contact of the northern metavolcanic unit. The contacts of this body and the wall rocks of the metasediments it intrudes, are sheared. In the shear zones, several auriferous quartz-carbonate veins occur. These rock relations appear to be common to all the old gold prospects of the map area, as previously mentioned. In addition, the gabbroic/dioritic stock and the gold prospect are located in the sheared metasediments that lie between the 2 ironstone bands, a situation very similar to the Geraldton area, an old gold producing camp (Bruce 1935, p.29).

Hudson Bay Exploration and Development Company Limited (6)

During 1972 to 1973, the Hudson Bay Exploration Development Company Limited was involved in an exploration program called the Longlac Project. This was conducted over a large area located east of Longlac and including some parts of the map area. In the map area, the program outlined 3 conductive zones. Of the total of 34 diamond-drill holes completed in a diamond-drill program, 1 of the conductor zone was tested by 4 diamond-drill holes (*see* also sections on "Edward M. Lyons (7)", "Mattagami Lake Mines Limited (8)", "Temagami Oil and Gas Company Limited (16)"; Resident Geologist's Files, Ontario Ministry of Natural Resources, Thunder Bay).

A second conductor zone located south of Klob Lake was not tested by diamond drilling, but a third conductor zone, located on the western shore of Castlebar Lake, on the companies' claim TB 334384 was tested by 2 diamond-drill holes totalling 353 feet in length, in 1972. These drill holes are reported to have intersected andesitic volcanic rocks hosting pyrrhotite-pyrite disseminated zones from 2.5 to 10 feet thick and containing from 5 to 30 percent sulphide minerals. The collar positions were not located by the current field survey.

In the vicinity of this latter conductor, outcrops of a porphyritic and recrys-

tallized mafic flow are cut by quartz-carbonate veins that contain no visible mineralization. The claims were allowed to lapse.

Edward M. Lyons (7)

Two groups of contiguous unsurveyed mining claims, numbered TB 527219 to TB 527224 (6 claims) inclusive and TB 527214 to TB 527215 (2 claims) inclusive are currently registered to Edward M. Lyons. In 1977, the same 2 groups, with the same claim numbers were registered to Hugh Shearer.

This ground, together with that of Joseph Carre (4) and George Potter (14) were on option to Pacific Cyprus Mines Limited in 1977, and in 1978 to Dora Explorations Limited (Assessment Files Research Office, Ontario Geological Survey, Toronto). On May 10, 1977 Pacific Cyprus Mines Limited contracted Questor Surveys Limited to conduct an airborne electromagnetic and magnetic survey over these properties, which in total consisted of 66 claims at the time of the option (Assessment Files Research Office, Ontario Geological Survey, Toronto).

GEOPHYSICAL SURVEYS

A detailed description of the airborne geophysical survey by Questor Surveys Limited is reported in the section under Joseph Carre (4). Pollock (1977), stated that the Input Survey outlined many zones of conductivity. On this property, conductor zones were outlined in the northern group (6 claims), but no conductors were outlined on the southern group (2 claims).

According to Pollock (1977, p.5), 1 conductive zone had "a strike length of from ½ to ¾ mile but [was] open to the east. It straddled a magnetic high of 80 to 120 gammas. Massive sulphides were thought to probably have been the cause."

There is no record of subsequent work on this ground by the owners or those who optioned it, but in 1972 and 1973, Hudson Bay Exploration and Development Company Limited conducted an extensive diamond-drill program in the general vicinity of the Longlac area (Resident Geologist's Files, Ontario Ministry of Natural Resources, Thunder Bay). Diamond-drill hole G2 is 351 feet long and drillhole G4 is 276 feet long. Both were used to test conductor zones on this property, and according to the Resident Geologist's Files, intersected disseminated to massive sulphide zones 1 to 12 feet thick in the area of the conductor zones described by Pollock (1977). Traces of chalcopyrite are reported, but no assay data were found.

GENERAL GEOLOGY

No rock exposures exist on either of the claim groups, however, the northern group is interpreted to be in the northernmost area of the mafic metavol-

canic flows and is near the southern boundary of the O'Meara Lake Stock. The southern group is located just north of the eastern end of Klob Lake. This group is in the most southerly area of the northern mafic metavolcanic flows near the southern boundary (western end) of the Wee David Lake Stock. During the mapping of several outcrops in the vicinity of the property, several zones of banded interflow tuffs, siliceous mafic flows, porphyritic flows (feldspar porphyry), and numerous quartz-feldspar porphyry, mafic, and granitic dikes were observed. This stratigraphy is correlatable with the rocks intersected in the diamond drilling.

Mattagami Lake Mines Limited (8)

Mattagami Lake Mines Limited owns 29 unpatented contiguous mining claims numbered TB 394300 to TB 394304, TB 394313 to TB 394322, TB 435133 to TB 435135, TB 435192 to TB 438500, TB 455501 to TB 455508 all inclusive and were staked to cover an area of interesting geology in 1977 (Sutherland 1977). From March 22 to 31, and April 29 to May 15, 1977, a grid of north-south picket lines, spaced at 400-foot intervals, and consisting of 29.6 miles of picket line, was cut to cover the entire claim group, and ground magnetic and electromagnetic surveys as well as geological-geochemical work were completed. These surveys were followed up by a diamond-drilling program which was carried out between November 6 and 22, 1977.

MAGNETIC AND ELECTROMAGNETIC SURVEYS

Twelve conductive zones were interpreted from the MAG and EM survey results. Over most of the grid, magnetic relief was less than 1000 gammas and the contours suggested a regional northeast-southwest trend (Sutherland 1977). On the western part of the property, however, there were several well-closed magnetic "highs" and "lows" with up to 5000 gammas relief. These features probably correlate with a mafic intrusive diabase dike which strikes northwest in the area (Sutherland 1977).

PREVIOUS GEOPHYSICAL SURVEYS

In 1977, ABEM-MAG survey of Questor Surveys Limited conducted for Pacific Cyprus Mines Limited (Assessment Files Research Office, Ontario Ministry of Natural Resources, Toronto), located conductive zones numbered 10-12-13-14-part 15, corresponded to Zone A of Mattagami Lake Mines Limited, and conductive zones 11 and 15 corresponded to Zone B and J-I respectively of Mattagami Lake Mines Limited.

GEOLOGY-GEOCHEMISTRY SURVEYS

All exposures on the geological and geochemical map of Mattagami Lake Mines Limited were examined by the field party. The interpretation by Mattagami Lake Mines Limited outlines the geology as indicated on Map 2469, back pocket. The property is located in the mafic metavolcanic flows, and is located between the O'Meara Lake and Wee David Lake Stocks.

In the geochemical survey, several rock samples were collected. The XRF geochemical analyses indicated 3 localities which have an anomalous zinc and copper content (Assessment Files Research Office, Ontario Geological Survey, Toronto). In the first locality on claim TB 394316, Sample A-1 returned values of 20 300 ppm zinc and 1200 ppm copper [company report]. The locality covered by conductors J and A were tested by diamond-drill holes P-J-77-1 and P-A-77-2 (*see* section on diamond drilling). From the second locality (claims TB 455503, TB 455504, and TB 435134), samples A-6 and A-8 returned values of 5100 and 3190 ppm zinc and 600 and 343 ppm copper respectively [company report]. In locality 3, found near the contact with the Wee David Lake Stock, samples A-22, A-23A, and A-23B (Claim TB 394313) returned metal values of 6710, 1700, and 4460 ppm zinc, and 860, 802, and 666 ppm copper respectively [company report].

DIAMOND DRILLING PROGRAMS

In December 1972, the area underlining conductor B of Mattagami Lake Mines Limited was tested by diamond-drill hole number G2 of Hudson Bay Exploration and Development Limited to a depth of 326 feet (Regional Geologist's Files, Ontario Ministry of Natural Resources, Thunder Bay). This hole intersected massive and banded garnetiferous andesite, massive dacite to rhyolite(?) and quartz-feldspar porphyry. The conductor was concluded to be due to a 24-foot long section containing 3 zones from 2 to 3 feet thick, comprising stringers of pyrrhotite, pyrite, and graphite; and several graphitic schist zones ranging from 3 to 25 feet thick (Regional Geologist's Files, Ontario Ministry of Natural Resources, Thunder Bay). The collar position was not located during the current field survey and its position on the Map 2469, back pocket is derived from company sketch maps available in the Regional Geologist's Files, Ontario Ministry of Natural Resources, Thunder Bay.

In the winter of 1977-1978, 4 diamond-drill holes, numbered P-J-77-1, P-A-77-2, P-I-77-3, and P-B-77-4, and totalling 1793 feet in length were collared by Mattagami Lake Mines Limited on claims TB 394315, TB 435197, TB 394317, and TB 435133 to test conductor zones J, A, I, and B respectively. The conductors are generally due to thin zones of disseminated to semi-massive pyrite, pyrrhotite, or graphite most commonly in andesite or silicified andesite (Assessment Files Research Office, Ontario Geological Survey, Toronto). The collar position for P-B-77-4 was located in the field, but the location of the other drillholes was obtained from company maps available in the Assessment Files Research Office, Ontario Geological Survey, Toronto.

GENERAL GEOLOGY

All outcrops examined on the property consist of mafic metavolcanic flows which exhibit several textures and structures: banded interflow tuffs; porphyritic, siliceous, and massive phases; pillowed zones; amygdaloidal/vesicular areas; and banded, contaminated gneissose units near contacts with the Wee David Lake Stock. Into these metavolcanics are intruded the Wee Lake Stock with its apophyses and epiphyses; the O'Meara Lake Stock with its apophyses and epiphyses; and diabase dikes. In the field, several gossan zones related to the feeder dikes or sills of the stocks were observed. In one area just west of drillhole number P-B-77-4, which was located by the field party, and drillhole number G1, which was not located by the field party, pyrite-pyrrhotite dissemination noted in the outcrops, was probably adequate to explain conductor B on the surface. Geochemical sampling of the rocks succeeded in outlining the gossan-like areas and possibly established a background value for the metals selected.

The sulphide mineralization outlined by ground geophysical methods and confirmed by diamond drilling is intraformational within the metavolcanics, but does not appear to be continuous along strike. Therefore, the sulphide mineralization may not be stratigraphically correlated.

The magnetometer survey successfully outlined the location of a diabase dike about 30.8 m wide striking northwest through the southwestern part of the property. In outcrops of this dike located on the south side of Highway 11, visible magnetite grains were observed.

Milestone Exploration Limited (9)

Milestone Exploration Limited holds 16 contiguous surveyed and patented mining claims numbered TB 22585 to TB 22593, TB 22603 to TB 22605, and TB 22608 to 22611, all inclusive. These claims are located to the north and west of Adel Lake or north of Paglamin Lake. The ground covers the "Caramat Gold Mines Occurrence", a gold-copper showing which was first explored in 1936 (MacDonald 1938, p.38).

HISTORY

The name of the company was changed from Caramat Gold Mines Limited to Milestone Exploration Limited in 1968 (Murdoch Mosher, president of the company, Toronto, personal communication, 1979).

The occurrence was first explored during the summer of 1936 when surface exploration work (trenches etc.) was carried out. A diamond-drilling program was completed the following winter (MacDonald 1938, p.38). According to MacDonald (1938, p.39):

> The showing is situated at the northeast end of Paglamin Lake and consists of a carbonated quartz vein in sheared porphyritic quartz diorite. The wall rock contains abundant sericite and

some carbonate. The shear zone, which has been traced on the surface for 300 feet, strikes east-west and dips steeply south. The vein ranges in width from 6 to 12 feet. Pyrite and chalcopyrite occur fairly evenly throughout the quartz. Visible gold is present. Assay values from surface work were sufficient to warrant a diamond drilling campaign.

The author was unable to locate the results of the diamond drilling and the assay values conducted following and/or during surface work. There is also no record of subsequent surveys conducted on this property during the 1940s, 1950s, and 1960s. A number of old and recent trenches were found during the current field mapping. According to Murdoch C. Mosher (president of the company, personal communication, Toronto, 1979) the company has from time to time conducted geological and mechanical surveys on the property, but no exploration work record has been submitted for Assessment Work Credit.

GENERAL GEOLOGY

Several outcrops and trenches in the property were examined in detail by the field party during the current field mapping. The property is predominantly covered by drift and glacial material, but outcrops indicate that the property includes the contact between the Paglamin Lake Stock and the gabbro/diorite sill lying in the vicinity of Paglamin and Secon Lakes. The Paglamin Lake Stock is a distinctive granodiorite to trondhjemite stock which is characterized by blue quartz eyes, green sericitized plagioclase, and mafic inclusions. The stock is predominantly massive, but may be locally porphyritic and in some areas of the property, it is extremely well foliated and sheared. The metasediments south of the property (for example, south of Adel Lake) seem to be unaffected by the faulting, and retain such sedimentary structures as crossbedding and graded bedding, channelling and load structures. The contact between the gabbro/diorite and Paglamin Lake Stock contains sulphide mineralization on the northern shore of Paglamin Lake and will be described in the next 3 paragraphs.

On the northwestern shore of the lake, 2 north-south trending trenches about 30 m long expose mineralization consisting of pyrite and minor amounts of chalcopyrite associated with auriferous quartz-carbonate veins. These are located in shear zones within the Paglamin Lake Stock whose strike length and width could not be traced due to the scarcity of outcrop. Visible gold was reported from the property (MacDonald 1938), but was only noted from assay results submitted by the field party. At the northeastern shore of the lake, 2 more trenches expose the highly sheared, cataclastic nature of the contact zone between the highly sheared Paglamin Lake Stock, and exposed quartz-chlorite schists, and quartz-carbonate veins up to 5 cm wide. Trace amounts of chalcopyrite and pyrite with minor bornite were found in association with the quartz-carbonate veins. Disseminated pyrite is ubiquitous in the sheared stock, but the quartz-chlorite schists are notably barren of sulphide mineralization.

Several of the trenches were examined and sampled by the field party within the property. Several of the samples contain pyrite and minor chalcopyrite. The 2 best mineralized samples were assayed by the Geoscience Laboratories, Ontario Geological Survey, Toronto, and gave 23.5 ppm gold, 910 ppm copper, and 74.3 ppm gold, and 1250 ppm copper.

Leonard Morrow [1976] (10)

It is not known how large a property was held by Leonard Morrow in 1976 in the area about 2440 m northwest of Snoopy Lake. Assessment work files indicate that between October 2 and November 4, 1976, 2 diamond-drill holes numbered 1 and 2, were drilled by Leonard Morrow on his claim TB 434688 within the area. These holes were designated as the Number 2 Group. Hole Number 1, 70 feet deep, did not intersect any mineralization, but hole number 2, 57 feet deep, intersected quartz (chert?) stringers with minor amounts of pyrite and chalcopyrite throughout the length of the hole, within coarse-grained (gritty) sandstones (Assessment Files Research Office, Ontario Geological Survey, Toronto).

In this area, narrow ferruginous zones contain seams of magnetite ironstone and chert, and are interlayered with narrow mudstone layers. Associated beds of coarse-grained (gritty) sandstone, together with a few outcrops of pebble conglomerate were mapped by the author and his assistants. The drillholes could not be located, the approximate position is shown on Map 2469, (back pocket). No assay data are available in the Assessment Files Research Office, Ontario Geological Survey, Toronto.

Albert Onesime (11)

During the 1979 field season, Albert Onesime of Longlac staked 6 contiguous unpatented mining claims numbered TB 456213 to TB 456218 inclusive. These were located to the east of Adel Lake, over the Klob Lake-Hoiles Creek Fault that in this area parallels the Gravel River-Kamuck River Fault (Carter 1975). Later, during the field season, an additional 19 contiguous unpatented claims numbered TB 456219 to TB 456222 and TB 456238 to TB 456254 both inclusive were staked to the north of, and adjoining the earlier group, to form part of a large claim block of 25 contiguous, unpatented, and unsurveyed mining claims.

The property covers a surface exposure of mixed sulphide- and oxide-facies iron formation which is extensively exposed by trenching. In 1963, an airborne electromagnetic survey by Ranworth Exploration Limited was conducted over a large area that included this property. An electrical conductor numbered 1A was located in the southern part of this ground. From information on file in the Resident Geologist's Files, Ontario Ministry of Natural Resources, Thunder Bay, the conductor does not appear to have been tested by diamond drilling.

During the field mapping, the iron formation is exposed and trenches were examined and selectively grab sampled. The ironstone-bearing unit which is 1.3 km by 0.3 km on the surface is made up of disseminated to massive seams 1 to 2 cm wide composed of pyrrhotite, pyrite, and magnetite near banded quartz-amphibolite metasediments or metavolcanics (east end) and wider seams (2 to 15 cm wide) of magnetite, pyrrhotite, and pyrite in local graphitic and talc-sericite schist zones of altered metasediments or metavolcanics. Assay results of selected grab samples by the Geoscience Laboratories, Ontario Geological Sur

vey, Toronto, returned the following metal values: 20.9 percent total iron, 51 ppm copper, 9 ppm gold, and 29 ppm zinc.

Harold and Lawrence Otto (12)

Harold and Lawrence Otto own a large block of about 77 contiguous unpatented and unsurveyed mining claims in the southeastern part of the map area.

According to Harold Otto (one of the owners, personal communication, 1979), the Otto brothers have been active in the area since the 1960s. Data in the Assessment Files Research Office indicate that exploration work records on this property were first filed in 1972. The volume of exploration work records submitted on this property for assessment work credit indicated that extensive exploration survey work has been done.

Exploration work carried out includes stripping of outcrop areas, trenching, pitting, and shaft sinking. All the pits, trenches, and shafts that were examined by the field party are included on the geological map. Only traces of mineralization were observed in wacke, in all of the localities examined by the field party. Disseminated to minor pyrite was observed in the 15 m deep shaft located in a diabase dike that cut across metasediments in the area just north of Pagwachuan Lake (claim TB 295641).

DIAMOND DRILLING AND ASSAY WORK

According to information in the Assessment Files Research Office, Ontario Geological Survey, Toronto, 22 diamond-drill holes having a total length of 4352 feet were collared by H. and L. Otto. The logs indicate intersections of zones with minor amounts of pyrite-pyrrhotite and the approximate location of some of the holes is indicated on Map 2469, back pocket. Reported assays from claims TB 329680 and TB 329686, and from the shaft on claim 295629 indicate trace to nil gold values. One sample from the 30-foot level of the shaft returned 0.01 percent gold.

PREVIOUS EXPLORATION

The Pagwachuan Lake Mining occurrence (MacDonald 1938) is located immediately west of Adel Lake. In 1936, this property consisted of 15 mining claims on which surface exploration work was conducted during 1936 to 1937 (MacDonald 1938, p.39). MacDonald also reported that on this property, several small shear zones were found to contain visible gold and pyrite disseminated throughout the silicified shear zones, and that assay results indicated only traces of gold.

During the field mapping, several overgrown trenches were found near the landing on Adel Lake, just west of the western shore of Adel Lake. In the sum-

mer of 1979, several diamond-drill holes were collared by Harold Otto on the landing on the western shore of Adel Lake. The drill core consists of a highly sheared porphyritic rock (with fault breccia zones) which is considered to be granitic in origin. The porphryitic rock contains 1 to 2 percent pyrite that is extensively disseminated throughout the core.

The 1963 airborne electromagnetic survey by Ranworth Exploration Limited was conducted over a larger area that included parts of the property. Parts of the Otto ground indicated electrical conductor zones numbered 5 (Gabbro Lake east), 1 (Adel Lake), and part of 2 (Adel Lake). According to the Resident Geologist's Files, Ontario Ministry of Natural Resources, Thunder Bay, these conductors were not tested by a diamond-drilling program.

According to the current geological interpretation, conductors 1 and 5 both lie along the Klob Lake-Hoiles Creek Fault located south of Adel Lake. Conductor 2 is associated with local subsidiary shear zones of the Klob Lake-Hoiles Creek Fault. This zone is probably similar to the Caramat Gold Mines Occurrence just to the north where the shear zones are reported to contain auriferous quartz-carbonate veins containing pyrite and minor chalcopyrite (MacDonald 1938).

GENERAL GEOLOGY

The property is divided into a northern part and a southern part by the Gravel River-Kanmuch River Fault (*see* section "Faults") which extends into the map area. The northern part of the property is underlain by metasediments which consist of interlayered mudstone, wacke, feldspathic wacke (with minor narrow metavolcanic units), and sheared equivalents. At Adel Lake, the metasediments are intruded by the Paglamin Lake Stock. Several outcrops of mafic metavolcanics which may outline a band of mafic to intermediate metavolcanics were also mapped.

In the southern part of the property, the rocks are predominantly garnetiferous metasedimentary migmatites with recognizable relict bedding. These rocks have been interpreted as metamorphosed equivalents of the rocks of the northern part. The rocks of the southern part are extensively intruded by conformable and nonconformable garnetiferous pegmatite sills and dikes.

Placer Development Limited (13)

This company holds 2 isolated blocks, each consisting of 3 unsurveyed claims, adjoining the property of Edward M. Lyon (7) on the west and southeast. The groups are made up of claims TB 527216 to TB 527218, and TB 527225 to TB 527227, both inclusive.

According to company personnel, the groups were obtained on the basis of an option agreement from Dora Explorations Limited, and a drill program was anticipated (probably as a follow-up survey) for the 1979 field season. The author and his assistants are not aware of any work conducted on the property during the field season, and there was no record of any exploration work con-

ducted on the property in the Assessment Files Research Office, Ontario Geological Survey, Toronto at the time of writing.

No bedrock exposures exist on the property, which is probably underlain by pillowed mafic flows of the northern mafic metavolcanic unit just west of the Wee David Lake Stock.

George Potter (14)

Two groups of claims numbered TB 492112 to TB 492137 (the east group) and TB 492140 to TB 492145 (the west group), both inclusive, are owned by George Potter. In 1977 the property, together with that of Joseph Carre (4), and Edward M. Lyons (7) were on option to Pacific Cyprus Minerals Limited, and in 1978 to Dora Explorations Limited (Assessment Files Research Office, Ontario Geological Survey, Toronto).

GEOPHYSICAL SURVEYS

On May 10, 1977, Pacific Cyprus Minerals Limited contracted Questor Surveys Limited, to conduct an airborne electromagnetic and magnetic survey over the 3 claim groups which consisted of 66 claims (Pollock 1977). Numerous zones of anomalous geophysical conductors were outlined in the survey as reported in the section "Joseph Carre (4)". Five conductor zones were located on the property (Pollock 1977). The conductor areas are covered by sand, diamond-drilling is not reported; therefore, the possible cause of these conductors cannot be assessed with certainty.

PREVIOUS DIAMOND DRILLING

In 1955, Howard Geno of Longlac owned a large claim group on this ground in the area along Klob Creek just north of Klob Lake. In October of 1955, 3 short diamond-drill holes totalling 60 feet in length were collared on claim TB 61367. Only trace values of gold were returned from various samples from each hole (Assessment Files Research Office, Ontario Geological Survey, Toronto).

In 1963, that part of George Potter's property north of the western end of Klob Lake (conductor 16, and parts of 17 and/or 18) was owned by A.W. Adam. Three of the claims of A.W. Adam were TB 104026, TB 101997, and TB 101998. According to the Resident Geologist's Files, Ontario Ministry of Natural Resources, Thunder Bay, and the Assessment Files Research Office, Ontario Geological Survey, Toronto, manual labour and stripping by mechanical equipment was carried out on claim TB 101998, and several pits and 1 trench, 65 feet by 11 feet by 17 feet were excavated. During the current survey, these excavations were not located by the field party, but the location is indicated approximately on Map 2469 (back pocket) north of Klob Lake, just north of the East Road. In 1963, 2 diamond-drill holes totalling 251 feet were also collared on TB

101998. The holes intersected chloritized mafic flows containing disseminated pyrrhotite and trace chalcopyrite (Regional Geologist's Files, Ontario Ministry of Natural Resources, Thunder Bay). Assay results of samples submitted to the Geoscience Laboratory by C. Pettit indicated no nickel associated with the pyrrhotite, but did show "considerable lead in form of fine grained galena, and trace gold" (Resident Geologist's Files, Ontario Ministry of Natural Resources, Thunder Bay). The collar positions were not located by the current field survey, but the approximate location of the holes is indicated on the geological map (Map 2469, back pocket).

GENERAL GEOLOGY

In the property, a few isolated outcrops of pillowed mafic metavolcanics are exposed in the east claim group. The property is interpreted to lie in the southernmost unit of the northern mafic metavolcanics between the Wee David Lake Stock, and the Klob Lake-Hoiles Creek Fault. Although there is no field evidence for the Klob Lake-Hoiles Creek Fault in this property, in the area to the east of Hope Lake, the fault is indicated by sheared and silicified or carbonatized country rocks. No conductors were outlined on the western claim group, and no outcrops were exposed in the entire claim group. On the adjoining property, to the east [Temagami Oil and Gas Company Limited (16)] several conductor zones were interpreted to trend into the property by Mattagami Lake Mines Limited (zone A-1, A-2) and Pacific Cyprus Minerals Limited (Zone 10). These conductors were diamond drilled by Hudson Bay Exploration and Development Company (6) (DDH Number G3). Several major conductor zones consisting of disseminated pyrite-pyrrhotite were intersected. In addition, outcrops exposed along Highway 11 on the property of Temagami Oil and Gas Company Limited (16), which were examined by the field party, contained isolated gossan zones related to porphyritic granitic dikes. The selected chip samples returned trace to low assay values in gold, copper, and zinc. Since the northern part of the west claim group is on strike to the area of sulphide mineralization, the mineralization could extend into the western claim group of George Potter (14).

Shell Canada Resources Limited (15)

As of December 31, 1979, Shell Canada Resources Limited owned 11 isolated blocks of claim groups in the map area and the surrounding country. In the map area, the property consisted of a total of 53 claims. A group of 10 contiguous unpatented claims were located northwest of Snoopy Lake. Seven claim groups totalling 31 unpatented mining claims were located in the Faith-Hope-Charity Lakes area, Gabbro Lake area, Gabbro Lake North area, Hoiles Creek area, Hoiles Creek North, Hoiles Creek South, and Lydia Lake East area. There are 3 groups of claim blocks totalling 12 unpatented claims which are located in the Todd Lake Southeast, Todd Lake Northeast, and Adel Lake East

areas. These claim blocks cover the following old occurrences; The Kenogamisis Gold Mines Prospect [1936/37], Ward-Morrow Prospect [1936] and Ranworth Exploration Limited Prospect[1963].

KENOGAMISIS GOLD MINES PROSPECT

The claims held by Kenogamisis Gold Mines Limited in 1936 were located 3.2 km northeast of Rankin Bay or west of Snoopy Lake, on Pagwachuan Lake. The main showing, located on the claims TB 22375 and TB 22380 of Kenogamisis Gold Mines Limited was examined by stripping and trenching. An irregular quartz vein containing disseminated pyrite, chalcopyrite, and arsenopyrite was reported by MacDonald (1938, p.39) to have assayed as high as $29.00[1] to the ton over narrow widths. The average value is much lower.

During the current field mapping, the old workings were found by the field party to occur along a sheared contact between mafic metavolcanics (minor metasediments) and a gabbro/diorite intrusive body. In this area, a test pit approximately 0.6 m deep had been blasted in a gossan zone within a chlorite schist containing sulphide facies (pyrite-pyrrhotite) iron formation. Assay values of selected grab samples collected from the pit by the field party returned only up to 10 ppb gold (Assays by Geoscience Laboratories, Ontario Geological Survey, Toronto).

WARD-MORROW PROSPECT

A. Ward and W. Morrow held 2 groups of claims in the map area during 1936 to 1937. One prospect is now held by Bonnar Durst (property 6 on Map 2469, back pocket). The other group of claims was located 2.4 km northeast of Gabbro Lake, that is in the ground currently held in the Gabbro North Group of Shell Canada Resources Limited (15). According to MacDonald (1938, p.39), this property is underlain by "greenstone" which is intruded by quartz diorite and assay values of selected trench samples from a heavily mineralized shear zone returned between $4.00[1] and $5.00[1] per ton.

Several long old trenches, over 15 m in length, were located by the author and his assistants in an extensively sheared area between Secon and Lydia Lake containing off-shoot dikes of the Paglamin Lake Stock intruded into sheared mafic metavolcanics. Although the dikes and the metavolcanics were extensively mineralized with visible disseminated pyrite with or without pyrrhotite, no visible gold was observed. Assays of selected grab samples collected by the field party gave 890 ppb gold, 96 ppm copper, 55 ppm nickel, and 53 ppm zinc (Assays by Geoscience Laboratories, Ontario Geological Survey, Toronto). This mineralization does not seem to be extensive, and the assayed samples did not contain significant metal values.

[1]The price of gold in 1938 was $35.19 per ounce.

RANWORTH EXPLORATION PROSPECT

Late in 1962 or early in 1963, Ranworth Exploration Limited contracted Canadian Aero Mineral Surveys Limited to conduct an airborne electromagnetic survey on a large area, the limits of which are not known to the author. In the conductor outline submitted for assessment credit (Assessment Files Research Office, Ontario Geological Survey, Toronto) some of the conductors fall within current claim blocks of Shell Canada Resources Limited.

Most of the conductor zones do not appear to have been tested by diamond drilling according to the files available in the Resident Geologist's Files, Ontario Ministry of Natural Resources, Thunder Bay, and Assessment Files Research Office, Ontario Geological Survey, Toronto. Conductor number 6 located on claim TB 105398 (currently part of Shell's Lydia Lake East group) was tested by 2 diamond-drill holes which totalled 595 feet in length (Assessment Files Research Office, Ontario Geological Survey, Toronto). The holes appear to have been collared in mafic flows, but intersect graphitic zones containing disseminated to massive zones of pyrrhotite and pyrite. Chemical analyses of the core indicated nil to trace copper values, and no values for zinc. The collar position was not located by the current field party, but the approximate position is indicated on Map 2469 (back pocket).

Several outcrops exposed along Highway 11, east of Lydia Lake, in the general vicinity of conductor 6, have gossan zones containing disseminated pyrite and pyrrhotite, with minor disseminated chalcopyrite. These gossan zones occur in mafic pillowed flows and associated tuffs which are visibly silicified. Assays of selected grab samples collected by the field party returned metal values of 6.80 ppb gold, 132 to 360 ppm copper, and 90 to 130 ppm zinc (Assays by Geoscience Laboratories, Ontario Geological Survey, Toronto).

SHELL CANADA RESOURCES SURVEYS

During the 1979 field season, Shell Canada Resources Limited conducted a systematic ground investigation of rocks of the map area and the surrounding country in areas staked by this company. Most of the work involved conducting ground geological-geophysical surveys that were apparently the result of a follow-up of an airborne geophysical survey. The results of this investigation are not available to the author.

GENERAL GEOLOGY

Shell Canada Resources Limited own[ed] several groups of claims which are located at isolated points throughout the map area. These groups occur in the northern mafic metavolcanic unit, in the metasediments, or in the sheared contact between the Paglamin Lake Stock and the metasediments. In a majority of the claim groups, little or no outcrop is exposed, and some of the claim groups have been described elsewhere in this report. Those described elsewhere

include the claim group located northwest of Snoopy Lake (Kenogamisis Gold Mines Prospect), in the Pagwachuan claim map, Gabbro Lake North claim group (Ward-Morrow Prospect), the claim group located east of Lydia Lake (Ranworth Exploration Prospect), and the Hoiles Creek North claim block that is geologically similar to the Ward-Morrow Gabbro Lake North prospect. Those claim blocks in which no outcrops are found include the Hoiles Creek group, the Hoiles Creek South and the Faith-Hope-Charity Lakes groups. The last group covers the area of the 60 720 gamma magnetic high described in the section "Bonnar H. Durst (5)". In the remaining 4 claim groups, some outcrops were exposed as follows:

1. The Gabbro Lake area west claim group is located over the contact between the northern metavolcanic unit to the north, and the metasediments to the south. This area forms the most easterly extent of the southern band of the iron formation described previously under "Ironstone".
2. At Adel Lake East, the claim block is astride the contact between the sheared Paglamin Lake Stock and metasediments. One outcrop of a highly sheared and porphyroblastic granitic rock is exposed in Adel Lake, but the area covers conductor 2 of Ranworth Exploration. This conductor has not been tested by diamond drilling according to the available records.
3. The 2 last claim blocks located northeast and southeast of Toad Lake, are in an area underlain by mafic flows of variable texture and structure. Outcrops northeast of Toad Lake indicate local shearing and silicification; pillow structures occur occasionally, but the 2 outcrops southeast of Toad Lake are of massive to foliated mafic flows.

Temagami Oil and Gas Company Limited (16)

A total of 4 contiguous unsurveyed mining claims numbered TB 520420 to TB 520423 inclusive are held by Temagami Oil and Gas Company Limited. The claims are located on Highway 11, between the properties of Joseph Carre (4), Edward M. Lyons (7), George Potter (14), and Placer Development Limited (13).

No record of exploration work conducted by the owner was found, but in the 1977 airborne electromagnetic and magnetic survey of Pacific Cyprus Mines Limited, conductor zones 12 and part of 10, were located in this property. In the 1977/78 ground geophysical survey of Mattagami Lake Mines Limited (zones A-1 and A-2) together with conductor zone 10 of Pacific Cyprus Mines Limited were interpreted to trend towards this property. Conductor zone 10 was outlined by a part of conductor zone A (A-1 and A-2) of Mattagami Lake Mines Limited. In December 1972, conductor 10 of Pacific Cyprus Mines Limited and the western end of conductive zone A of Mattagami Lake Mines Limited were tested by diamond-drill hole number G3 drilled by Hudson Bay Exploration and Development Company Limited (Resident Geologist's Files, Ontario Ministry of Natural Resources, Thunder Bay). This drillhole intersected banded and massive andesite hosting scattered 1 to 18-foot thick zones of disseminated

pyrrhotite or pyrite, with a sulphide content varying from 2 to 25 percent (Resident Geologist's Office Files, Ontario Ministry of Natural Resources, Thunder Bay). The collar position was not located by the current field survey and its position is approximately indicated on Map 2469, back pocket.

Conductor 12, which also trends towards this property, was apparently not tested by Pacific Cyprus Mines Limited, nor by any other individual or company. Outcrops exposed in the property along Highway 11, 305 m west of the Northeast Road and examined by the field party, indicate a surface expression of conductor material consisting of isolated gossan zones related to cross-cutting porphyritic granitic dikes, intruded into pillowed mafic flows and associated tuffs, and may be responsible for the geophysical response designated conductor Number 12. In these gossan zones, visible pyrite and pyrrhotite were observed, together with trace amounts of chalcopyrite. Assay results of selected chip samples taken by the field party from the gossan zones gave 4 ppb gold, 580 ppm copper, and 600 ppm zinc (Assays by Geoscience Laboratories, Ontario Geological Survey, Toronto).

SUGGESTIONS FOR FUTURE EXPLORATION

The map area does not appear to be a prime target area for volcanogenic massive sulphide base-metal deposits of the Cu-Pb-Zn-Ag type, because exposures of felsic rocks within the map area are uncommon, and coarse-grained (proximal) pyroclastic rocks appear to be absent. These rocks are considered to be useful guides in the location of this type of deposit (Sangster 1972).

The massive to disseminated sulphide zones so far detected in the area appear to be discontinuous and local in nature, as indicated by the diamond drilling. Assays from samples of chalcopyrite-sphalerite mineralization are low, and range from: 6 to 580 ppm copper, with the best values of 280, 400, 450, and 580 ppm copper; 8 to 600 ppm zinc, the best values are 210 and 600 ppm zinc (assays of selected grab samples were collected by the Field Party and analyzed by the Geoscience Laboratories, Ontario Geological Survey, Toronto).

In the area around the town of Geraldton, a majority of the major producing gold mines, however, were located in clastic metasediments (Bruce 1937; Pye *et al.* 1966), near the contact with mafic metavolcanics to the north, and within 100 to 200 m of gabbroic rocks and magnetite ironstone-bearing iron formations. The inferred eastern extension of this horizon is located in the map area. Even though no significant gold deposits have been outlined, to date this area appears to be a favourable target for gold exploration. In addition, some gold production was realized in the Beardmore area further west, within a southern mafic metavolcanic unit (Mackasey 1970; Mackasey *et al.* 1974; and Pye *et al.* 1966) that is inferred to continue into the current map area. Owing to extensive Pleistocene deposits in the map area, both of the above favourable horizons are poorly exposed. Geophysical surveys capable of greater depth penetration are recommended to examine the southern metavolcanic unit, which to the best of the author's knowledge, has not previously been investigated.

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